

Redesign of Sago Tempe Chips Packaging Using a Kansei Engineering Approach

Perancangan Ulang Desain Kemasan Keripik Tempe Sagu dengan Pendekatan Kansei Engineering

Farhana Audia, Vonny Setiaries Johan*, Rahmadini Payla Juarsa, Yossie Kharisma Dewi, Mhd. Andry Kurniawan

Departement of Agriculture Technology, Faculty of Agriculture, Universitas Riau, Pekanbaru 28293, Indonesia

*Corresponding author: vonny.setiaries@lecturer.unri.ac.id

Submitted: 9 July 2025; Accepted: 30 December 2025

ABSTRACT

Sago tempe chips are snack products produced from soybeans combined with sago flour. Their current packaging uses transparent plastic with label stickers, resulting in a simple appearance that is less appealing to consumers. To attract more buyers, redesigning the packaging with the Kansei engineering approach is suggested. This study aims to develop a packaging design for sago tempe chips that aligns with consumer preferences, utilizing the Kansei engineering method. Packaging designs that address consumer needs and desires can help attract more customers. A survey with a Kansei engineering approach was conducted. Eight Kansei words were identified: informative, unique, artistic, attractive, quality, easy to use, innovative, and colorful. Using principal component analysis (PCA), the packaging design concepts extracted from these Kansei words were "informative," "colorful," and "quality." Analysis of ten packaging samples revealed that shape, supporting images, materials, color, and size are important design elements. Based on the R-squared value of quantification theory type 1 (QTT1), the "quality" concept was selected as it had the highest value. Sago tempe chip packaging is considered high-quality if it is a pillow-shaped bag, includes product images, uses aluminum foil, features more than three colors, and is medium-sized.

Keywords: Kansei engineering; packaging design; principal component analysis (PCA); quantification theory type 1 (QTT1); sago tempe chips

ABSTRAK

Keripik tempe sagu merupakan produk camilan yang dibuat dari kedelai yang dikombinasikan dengan tepung sagu. Kemasan keripik tempe sagu menggunakan plastik transparan dengan stiker label, sehingga terlihat sederhana dan kurang menarik bagi konsumen. Salah satu strategi untuk menarik konsumen adalah merancang ulang kemasan menggunakan pendekatan rekayasa kansei. Penelitian ini bertujuan untuk menghasilkan desain kemasan keripik tempe sagu yang sesuai dengan preferensi konsumen menggunakan pendekatan rekayasa kansei. Penelitian ini membantu menghasilkan desain kemasan yang sesuai dengan keinginan dan kebutuhan konsumen sehingga dapat menarik konsumen. Metode yang digunakan adalah survei dengan pendekatan rekayasa kansei. Berdasarkan penelitian ini, delapan kata kansei diidentifikasi, yaitu informatif, unik, artistik, menarik, berkualitas, mudah digunakan, inovatif, dan berwarna. Konsep desain kemasan yang diekstraksi dari kata-kata kansei menggunakan analisis komponen utama (PCA) diidentifikasi sebagai "informatif," "berwarna," dan "berkualitas." Elemen desain yang diidentifikasi dari 10 sampel kemasan meliputi bentuk, gambar pendukung, bahan, warna, dan ukuran. Berdasarkan nilai R-squared teori kuantifikasi tipe 1 (QTT1), konsep "berkualitas" dipilih karena memiliki nilai yang lebih tinggi. Kemasan keripik sagu tempe dianggap berkualitas jika memiliki desain kantong berbentuk bantal, menampilkan gambar produk, menggunakan bahan aluminium foil, menerapkan warna multiple (>3 warna), dan memiliki ukuran kemasan sedang.

Kata kunci: Analisis komponen utama (PCA); desain kemasan; rekayasa kansei; keripik tempe sagu; teori kuantifikasi tipe 1 (QTT1)

INTRODUCTION

Sago tempe chips are an innovative snack made from soybeans and sago flour. Their unique flavor and crispy texture make them a favorite snack for relaxing with family or friends. In addition to being delicious, sago tempe chips are also rich in vegetable protein, fiber, and carbohydrates, making them an attractive choice for consumers.

Pekanbaru. The sago tempe chips produced are packaged in 125 g sizes with a simple packaging design using transparent plastic and label stickers. Packaging design plays an important role in consumers' decision-making process to purchase a product by providing convenience, information, and enhancing visual appeal. The wide variety of tempe sagu chips available in the market,

each with different packaging designs, has made consumers increasingly selective and thoughtful in choosing products that align with their preferences. Therefore, manufacturers must focus on creating unique, practical, and informative packaging designs to ensure their products can compete and attract consumer interest in the face of intense market competition.

One strategy that can be implemented to attract consumers to purchase Permata Food Home Industry's sago tempe chips is to redesign the packaging according to consumer preferences. Consumer preferences are an individual's likes or dislikes regarding the products they consume (Kotler, 2001). This is useful so that the packaging design matches the desires and needs of consumers. Improving the packaging design of tempe chips is crucial to

attract consumer attention and boost sales. A simple packaging design often fails to capture attention and does not reflect the quality or uniqueness of the product, leading consumers to hesitate before purchasing. A method that can be used in redesigning packaging according to consumer preferences is kansei engineering.

Kansei engineering is a method that translates a customer's feelings and image of a product into design elements for computer-based product development (Nagamachi, 1995). This method has advantages in designing packaging based on consumer preferences. The use of this method can align each consumer perception of a preference or their feelings toward a product, as preferences can vary among individuals. Through Kansei engineering, consumer preferences can be harmonized to produce packaging designs that better align with the majority of consumers' desires.

The use of kansei engineering methods consists of several stages, namely preliminary surveys, literature studies, collecting data and product samples, collecting kansei words, creating questionnaires, distributing questionnaires, testing questionnaires, factor analysis, and packaging design (Mahera, 2021). The output obtained by using the kansei engineering method is a design specification that aligns with consumer needs and preferences. Product development tailored to consumer needs and preferences will inevitably lead to consumer satisfaction and increased purchasing power.

Previous studies have discussed the use of kansei engineering methods in food product packaging design to translate consumer emotions and preferences into design elements (Johan et al., 2024), (Syahputra & Sari, 2021), (Sari et al., 2023), (Jatmiko et al., 2023). Previous research on Kansei engineering using other methods in sago and tempeh chip packaging design has been conducted, namely using the Kano model, to identify product attributes that influence consumer satisfaction (Mabrurotin & Suryadi, 2025). However, most previous research has focused on food products made from common raw materials and has not specifically discussed sago and tempeh-based products as local foods. Furthermore, previous research tends to emphasize identifying emotional preferences without examining in depth the quantitative relationship between Kansei concepts and packaging design elements. The novelty of this research lies in the application of Kansei Engineering combined with Principal Component Analysis (PCA) and Quantification Theory Type 1 (QTT1) to systematically analyze the relationship between consumer emotional concepts and sago and tempeh chip packaging design elements. This approach allows for the determination of packaging design elements that contribute most to the perception of product quality based on consumer preferences, resulting in more targeted and data-driven packaging design.

This study aims to design sago tempe chips packaging that meets consumer preferences and needs through the Kansei Engineering approach. This method is used to interpret consumer preferences and emotions into product packaging design elements. This research is expected to provide solutions to packaging design issues, particularly for sago tempe chips. Additionally, the results of this study have the potential to serve as a reference for industry players in developing more attractive and competitive packaging in the market, through a systematic and consumer-oriented approach.

METHODOLOGY

Tools and Materials

The tools used were laptops, notebooks, writing instruments, recording devices, and questionnaires. The materials used were Qualitative data included an overview of the research object, interview results with respondents, and kansei words. Quantitative data included the number of respondents, questionnaire results, and the number of chip package samples.

Research Stages

This research was systematically organized into several stages, as presented in Figure 1.

Collection of Packaging Samples

The samples collected were chips packaging from several brands already on the market. A total of 10 packaging samples were collected based on the principle of sufficient design variation commonly used in Kansei Engineering research. The purpose of this sampling was to determine the criteria for tempeh chip packaging, as well as to compare packaging available on the market from a consumer perspective. The samples were selected to represent the variety of concepts and design elements of chip packaging circulating in the market. Packaging samples were obtained through direct and online observations via e-commerce in an exploratory-comparative manner aimed at identifying dominant design characteristics.

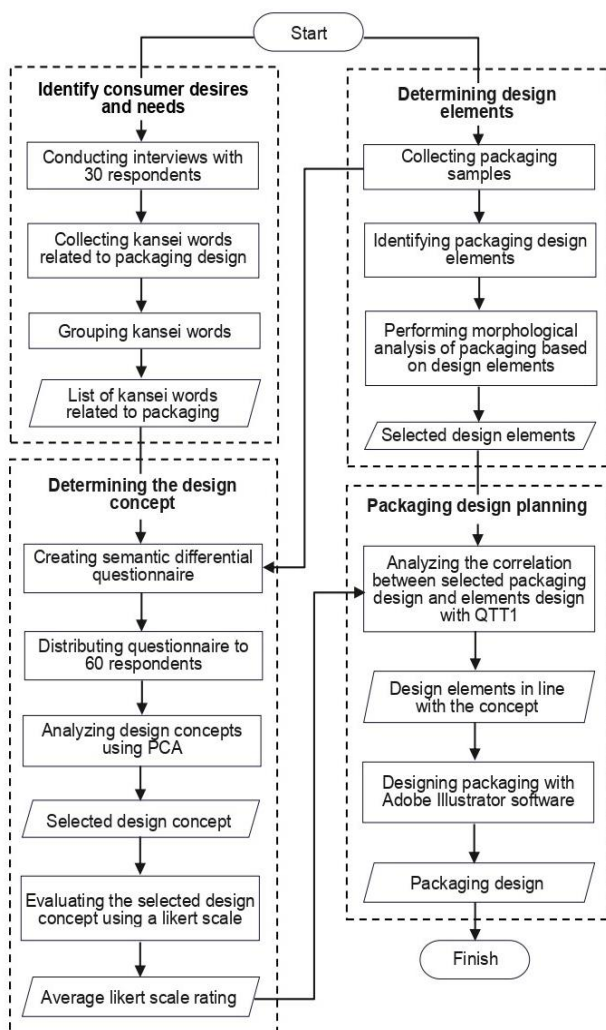


Figure 1. Research framework

Kansei Words Collection

Kansei words were collected in order to obtain kansei words that describe the characteristics and functions related to the packaging of Permata Food Home Industry's sago tempeh chips. Kansei words were collected to obtain as many impressions as possible that consumers would feel when they were unable to express them directly. These kansei words were obtained through interviews with 30 respondents. Respondents were selected using a purposive sampling method based on several criteria: aged ≥ 17 years, paying attention to packaging when purchasing products, and having purchased or consumed tempeh sago chips produced by Permata Food Home Industry at least once. Respondents aged ≥ 17 years were selected because in that age range, consumers have relatively independent cognitive abilities and purchasing decisions and are able to evaluate the visual and functional aspects of packaging rationally. The collected kansei words will be grouped based on similarity of meaning with the help of an expert, namely an Indonesian language teacher.

Determining The Design Concept

The kansei words and packaging samples that had been collected were then used for a semantic differential questionnaire that was distributed to 60 respondents. The semantic differential scale is a scale used to measure concepts or perceptions of an object in the form of a bipolar (two-pole) scale (Sukendra & Atmaja, 2020). The semantic differential questionnaire contained pairs of positive and negative kansei words with a scale of 1-5. The questionnaire was distributed both offline and online. The criteria for respondents were: aged ≥ 17 years, considering packaging when purchasing products, and enjoying consuming snacks. The number of respondents was determined using a linear time function equation (Mustaniroh et al., 2011):

$$n = \frac{\tau - t_0}{t_1} \quad (1)$$

Description :

- n = Number of samples
- τ = Time available for research
= 8 hours/day x 30 days
= 240 hours
- t_0 = Sample collection time
= 6 hours/day x 30 days
= 180 hours
- t_1 = The time taken by respondents to complete the questionnaire
= 1 hour/questionnaire

$$n = \frac{240 - 180}{1} = 60 \text{ respondents}$$

The results of the semantic differential questionnaire assessment were used for the kansei word extraction process using the Principal Component Analysis (PCA) method to produce design concepts. The PCA method was used to reduce the research data variables, such as kansei words and specimens, so that the remaining variables were the main variables without significantly reducing the data characteristics (Meida, 2019). The PCA analysis in this study was conducted using R Studio software. R Studio is a programming language-based software used for data processing and statistical analysis using a graphical user interface (Sarvina, 2017). The PCA results obtained are in

the form of principal components (PC) that must be retained, so that these PCs are translated into design concepts.

Identify Design Elements

After collecting the packaging samples, the design elements were identified. The identification was carried out through discussions with graphic designers to select relevant design elements. This was done to understand the important factors in design that could influence users' perceptions of the visualisation on the tempeh sago chip packaging. After identifying the design elements, the characteristics of the samples were analysed using morphological analysis based on the selected packaging design elements. Morphological analysis is a systematic effort to analyse the shape or structure of a product (Miftahuluddin, 2018).

Analysis of The Correlation Between Design Concepts and Design Elements

The resulting design concepts were then evaluated using packaging samples collected through a Likert scale questionnaire with a range of 1–5 to 60 respondents. A 1–5 Likert scale was used to facilitate respondents assessments and to maintain consistency in data interpretation. The respondent criteria were the same as those used in the semantic differential questionnaire distribution. The data obtained will be used to identify the correlation between the concept and design elements, which will be used as input data in the Quantification Theory Type 1 (QTT1) process. QTT1 analysis is the most commonly used method for directly analyzing and calculating the relationship between kansei words and design elements (Nagamachi, 2011).

The QTT1 analysis in this study was conducted using R studio software. The results obtained from QTT1 were category scores, partial correlation coefficients, and determination coefficients. Positive category scores indicate that the category has a strong relationship with the word kansei. The following are the steps of QTT1:

Step 1: Define a relational model related to the scores measured from the experimental sample in relation to consumer preferences. A categorical multiple regression model can be defined using the following equation:

$$\hat{y}_s^k = \sum_{i=1}^E \sum_{j=1}^{C_i} \beta_{ij} X_{ijs} + \varepsilon \quad (2)$$

Description :

- \hat{y}_s^k = Predictive value criteria variable for product samples s in image k
- i = Design element index
- E = Number of design elements
- j = Category index
- C_i = Number of category 1 design elements
- ε = Stochastic variable whose expected value is E (ε) = 0
- β_{ij} = Score of design element j in design elemen i
- X_{ijs} = Dummy variable coefficient

Step 2: Calculate the standard regression coefficient using equation 3 and the standard constant using equation 4.

$$\hat{y}_s^k = \sum_{i=1}^E \sum_{j=1}^{C_i} \beta_{ij}^* X_{ijs} + \bar{y}_s^k \quad (3)$$

$$\beta_{ij}^* = \beta_{ij} - \frac{1}{n} \sum_{j=1}^{C_i} \beta_{ij} X_{ijs} \quad (4)$$

$$\bar{y}_s^k = \frac{1}{n} \sum_{j=1}^{C_i} y_s^k \quad (5)$$

Description :

β_{ij}^* = Standard coefficient of explanatory variables

\bar{y}_s^k = Standard constant in the model

Step 3: Determine the correlated component regression matrix from the correlation coefficients of all variables.

Step 4: Calculate the multiple correlation coefficient (R), which is considered as the degree of relationship between external criteria variables and explanatory variables.

Step 5: Calculate the partial correlation coefficient (PCC) of design elements that show the relationship between product elements and product images.

Step 6: Determine the range of statistical variable categories that indicate the level of contribution to the prediction model in relation to the given product image.

RESULT AND DISCUSSION

Collection of Packaging Samples

Collecting packaging samples is the first step in designing packaging using kansei engineering. Collecting packaging samples serves as a starting point for understanding various aspects of design that will be analyzed in terms of aesthetics and functionality (Jatmiko et al., 2023). This also helps to link the visual elements of the packaging with the emotional response of customers, so that the resulting packaging meets customer expectations.

The criteria for the packaging samples collected include chip packaging from various brands and different raw materials, packaging with varying shapes and materials, as well as packaging available in the market through online platforms (e-commerce) or directly in Pekanbaru City. A minimum of 10–15 different samples were collected (Ariyanto et al., 2024). The collected packaging samples were used to provide a detailed visual representation of tempe sago chip packaging. Additionally, the packaging samples were used to provide information about the design elements present on the packaging, which could serve as a reference for redesigning sago tempe chip packaging. In this study, a total of 10 packaging samples were collected, as shown in Figure 2.

Table 1. Kansei words

No	Kansei words
1	Informative
2	Unique
3	Artistic
4	Attractive
5	High-quality
6	Easy to use
7	Innovative
8	Colourful

Table 2. Cumulative proportion results

	Eigenvalue	Variability (%)	Cumulative (%)
PC1	3.126	39.078	39.078
PC2	1.931	24.149	63.228
PC3	1.462	18.278	81.506
PC4	0.780	9.758	91.265
PC5	0.404	5.062	96.327
PC6	0.215	2.693	99.021
PC7	0.077	0.972	99.993
PC8	0.0005	0.006	100.000

Table 3. PCA component matrix

Kansei word	PC1	PC2	PC3
Informative	0.400	-0.390	-0.157
Unique	-0.426	-0.317	0.366
Artistic	0.348	0.074	-0.569
Attractive	0.080	0.507	0.051
High-quality	0.394	0.164	0.521
Easy to use	-0.449	0.213	-0.011
Innovative	-0.364	-0.271	-0.435
Colorful	-0.196	0.580	-0.225

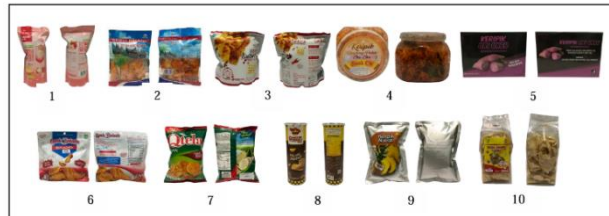


Figure 2. Packaging sample

Kansei Words Collection

A total of 114 kansei words were collected. Similar kansei words with the same meaning were grouped together to produce new kansei words, while still representing the previous kansei words. The kansei word is used to gather customer impressions regarding the characteristics of products that they truly desire (Kurniati, 2016). The kansei words were grouped through discussions with experts, resulting in 8 kansei words that represent consumer feelings toward the packaging of sago tempe chips. The grouped kansei words can be seen in Table 1.

Determining The Design Concept

The kansei words and packaging samples that had been collected were then used for a semantic differential questionnaire, and the average questionnaire assessment results were used as input data for this analysis. Principal Component Analysis (PCA) is a data reduction method used to identify a number of variables that can represent the variance of all variables. Kansei word extraction using PCA was performed to extract kansei words into design concepts. The results of PCA include eigen values, variability, and cumulative proportions of the total variance of each principal component, as well as coefficients for each principal component (Lokman, 2010). The results of the PCA analysis can be seen in Table 2.

The principal components (PC) formed from the PCA analysis consisted of eight principal components. PCs with eigenvalues ≥ 1 were considered significant (Kaiser, 1960). PCs are retained in order according to Kaiser's criterion, where the cumulative percentage of variance can explain 70% of the total data (Coghlan, 2014). Based on the analysis results, eigenvalues ≥ 1 are shown in PC1, PC2, and PC3, making them the components that must be retained.

The variability value in PC1 is 39.078, which means that PC1 explains approximately 39% of the total variation in the data. The same applies to the next PCs. The variability values in PC1, PC2, and PC3 are cumulative to obtain a cumulative value that meets the Kaiser criteria. Based on the cumulative values of PC1, PC2, and PC3, they can explain 81.506% of the entire data, so these three components meet the requirements to be retained. The values of the kansei coefficients included in the selected PCs are shown in Table 3.

Based on Table 3, it can be seen that the highest coefficients for each PC are informative (0.400), colorful (0.580), and high quality (0.521). The coefficient values in the

PCA component matrix are the highest positive values, because if a variable has the highest coefficient value in a factor, the stronger the correlation between the variable and the factor (Enzellina & Suhaedi, 2022). Therefore, PC1 is interpreted as the design concept "informative," PC2 is interpreted as the design concept "colorful," and PC3 is interpreted as the design concept "high-quality."

Identify Design Elements

Design elements were identified through discussions with graphic designers and by examining the appearance of 10 packaging samples. Based on the results of these discussions, five relevant design elements were selected, namely shape, supporting images, material, color, and size. The selected design elements will be used to analyze the characteristics of the samples using morphological analysis techniques. Morphological analysis is used to identify

similarities and differences in each packaging sample (Delfitriani et al., 2020). The results of the morphological analysis by observing 10 packaging samples can be seen in Table 4.

Analysis of The Correlation Between Design Concepts and Design Elements

Before conducting correlation analysis with QTT1, an assessment was carried out to measure consumer opinions on the suitability of 10 packaging samples with the selected design concept using a Likert scale questionnaire. The average values of the Likert scale results and morphological analysis results were used as input data for the correlation analysis. Quantification Theory Type 1 (QTT1) is one of the multiple linear regression analysis tools used to measure the relationship between design elements and design concepts (Nagamachi & Lokman, 2011).

Table 4. Morphological analysis of design elements

Shape (X1)	Supporting images (X2)	Material (X3)	Color (X4)	Size (X5)
Flat pouch (X1.1)	No image (X2.1)	Aluminum foil (X3.1)	A little color (X4.1)	Small (X5.1)
Standing pouch (X1.2)	Product image (X2.2)	PE plastic (X3.2)	Multiple color (X4.2)	Medium (X5.2)
Pillow pouch (X1.3)	Raw material image (X2.3)	PP plastic (X3.3)		Large (X5.3)
Cylinder (X1.4)	Regional icon image (X2.4)	Kraft paper (X3.4)		
Square (X1.5)				

Table 5. Category scores and partial correlation coefficients part 1

Design Element		Informative		Colorful		High-quality	
		Category score	PCC	Category score	PCC	Category score	PCC
X1	X1.1	-0.02000	0.66424	0.01000	0.65471	0.03000	0.47629
	X1.2	-0.42000		-0.42333		-0.13667	
	X1.3	0.18000		0.21000		0.13000	
	X1.4	0.08000		0.01000		0.03000	
	X1.5	0.78000		0.81000		0.03000	
X2	X2.1	-0.60000	0.82808	-0.60000	0.81413	-0.29000	0.82574
	X2.2	0.40000		0.40000		0.21000	
	X2.3	-1.00000		-1.00000		-0.39000	
	X2.4	0.20000		0.20000		-0.19000	
R ²			0.6900		0.6653		0.6854

Table 6. Category scores and partial correlation coefficients part 2

Design Element		Informative		Colorful		High-quality	
		Category score	PCC	Category score	PCC	Category score	PCC
X3	X3.1	0.21818	0.63027	0.21364	0.64784	0.18136	0.80173
	X3.2	-0.41818		-0.41364		-0.24136	
	X3.3	-0.50000		-0.55000		-0.30500	
	X3.4	0.02727		0.09545		-0.30045	
X4	X4.1	-0.11273	0.52240	-0.11455	0.53469	-0.01545	0.18343
	X4.2	0.45091		0.45818		0.06182	
X5	X5.1	0.07455	0.28987	0.31091	0.39841	-0.12591	0.36296
	X5.2	0.09273		0.07455		0.06045	
	X5.3	-0.13455		-0.17091		-0.04409	
R ²			0.4826		0.5292		0.6527

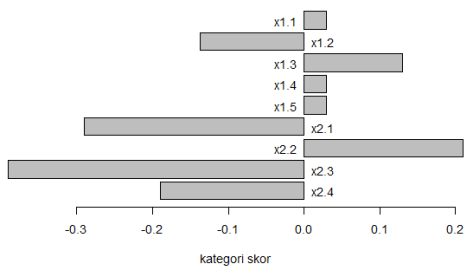


Figure 3. QTT1 score category informative concept part 1

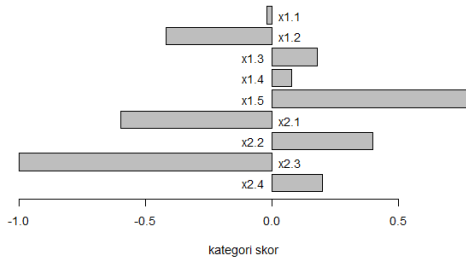


Figure 4. QTT1 score category colorful concept part 1

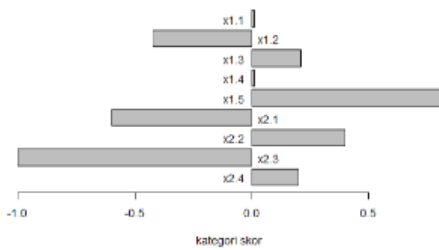


Figure 5. QTT1 score category high-quality concept part 1

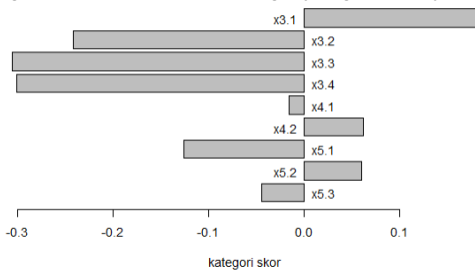


Figure 6. QTT1 score category informative concept part 2

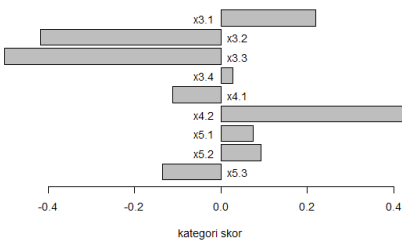


Figure 7. QTT1 score category colorful concept part 2

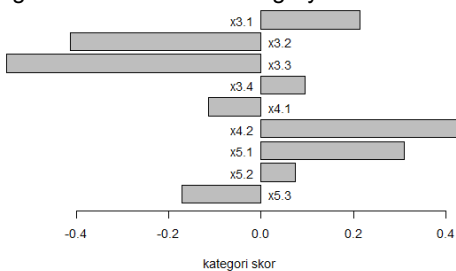


Figure 8. QTT1 score category high-quality concept part 2

The running data in the QTT1 stage was divided into two parts. The first running data contained two design elements that were tested, namely shape (X1) and image (X2). Figures 3, 4, and 5 show the plotting of the category scores for the first part on the concepts of informative, colorful, and high-quality.

Positive and negative signs in category scores reflect the relationship between design elements and design concepts. Based on Figure 3 on design element X1 (shape), the X1.5 (square) category graph points to the far right with a value of 0.78000, indicating a positive correlation with the informative design concept. Conversely, the X1.2 category graph (standing pouch) points to the far left with a value of -0.42000, indicating a negative correlation with the informative design concept. This also applies to other design element categories in Figures 4 and 5. The highest category score for each design concept can be obtained through the results of the first part of QTT1, which are presented in full in Table 5.

Design element categories were selected based on the highest positive category score. The Partial Correlation Coefficient (PCC) value indicates the relationship between design elements and design concepts. The PCC value indicates packaging development priorities (Sari et al., 2023). The highest positive values obtained in the informative concept were X1.5 and X2.2, in the colorful concept were X1.5 and X2.2, and in the quality concept were X1.3 and X2.2. The image element (X2) is the most dominant element in all three design concepts, with a higher PCC value than the shape element (X1). Therefore, the image element should be prioritized in the selected concept.

The second set of data contains three design elements that were tested, namely material (X3), color (X4), and size (X5). Figures 6, 7, and 8 show the plotting of the second set of category scores using QTT1 on the concepts of informative, colorful, and high-quality. The results of QTT1 part two are presented in full in Table 6. The highest positive values obtained in the informative and quality concepts were X3.1, X4.2, and X5.2, while in the colorful concept they were X3.1, X4.2, and X5.1. The R² recap values can be seen in Table 7.

In running part 1, the analysis results show that all three concepts have significant values because each concept has a value of more than 0.6. The R² values are 0.69 for the informative concept, 0.66 for the colorful concept, and 0.68 for the high-quality concept. In the second analysis, the high-quality concept (0.65) has a more significant value than the informative concept (0.48) and the colorful concept (0.52). R² must be > 0.6 for the data to be considered valid (Nagamachi, 2011). The summary of R² values indicates that the high-quality design concept is superior to the informative and colorful concepts because it has a higher R² value, and each R² value in running part 1 and part 2 of QTT1 is >0.6.

Based on the R² results, the selected design concept is a high-quality design concept. The selected design elements are pillow pouch packaging, product images, aluminum foil packaging material, multiple colors, and medium-sized packaging. The selected packaging design elements for use in the development of sago tempe chip packaging are taken from the design element category with the highest category score in the high-quality design concept.

Packaging Design Planning

The results of the QTT1 analysis were used as a reference in designing the packaging for sago tempe chips. The new packaging design for sago tempe chips can be seen in Figure 9.

Table 7. Recap of R² scores

	Informative	Colorful	High-quality
Running part 1	0.6900	0.6653	0.6854
Running part 2	0.4826	0.5292	0.6527



Figure 9. New packaging design for sago tempe chips.

CONCLUSION

The use of kansei engineering methods in redesigning the packaging of sago tempe chips has resulted in packaging that meets consumer desires and needs. Packaging for sago tempe chips that meets consumer desires and needs is packaging that is of high-quality. The term “kansei” was chosen to represent consumers' feelings toward tempe sago chip packaging, which are informative, unique, artistic, attractive, high-quality, easy to use, innovative, and colorful. Based on the results of the semantic differential questionnaire followed by PCA analysis, three packaging concepts were identified: informative, colorful, and high-quality. The design elements identified from the packaging samples are shape, supporting images, materials, color, and packaging size. Based on the results of the likert questionnaire distribution followed by QTT1 analysis, the high-quality design concept was selected as the concept most correlated with the identified design elements, as it had an R² value >0.6 in Part 1 (0.6854) and Part 2 (0.6527). Therefore, the high-quality concept was selected as the design concept for the new sago tempe chips, with the selected design elements having the highest scores in their respective categories: pillow pouch packaging shape (0.13000), product images (0.21000), aluminum foil material (0.18136), multiple colors on the packaging (0.06182), and medium-sized packaging (0.06045).

REFERENCES

Ariyanto, A. G. P., Rahdiana, N., & Yulianti, H. T. (2024). Perancangan desain kemasan kemasan keripik singkong uwa menggunakan metode kansei engineering. *Journal of Information Technology and Computer Science*, 7(6), 2355–2362.

Coghlan, A. (2014). *A Little Book of R For Bioinformatics*. In 2014. Cambridge.

Delfitriani, D., Rahmaningrum, V., & Ginantaka, A. (2020). Desain afektif kemasan produk household care berbahan baku serat selulosa pada PT XY. *Jurnal Teknologi Dan Manajemen Agroindustri*, 9(2), 134–142.

Enzellina, G., & Suhaedi, D. (2022). Penggunaan metode principal component analysis dalam menentukan faktor dominan. *Jurnal Riset Matematika*, 2(2), 101–110. <https://doi.org/10.29313/jrm.v2i2.1192>

Jatmiko, H. A., Kurniawan, A., & Ma'arif, R. (2023). Redesigning food packaging using kansei engineering method: case study at griya produksi SME. *Jurnal Ilmiah Teknik Industri*, 22(1), 58–66. <https://doi.org/10.23917/jiti.v22i1.21563>

Johan, V. S., Riftyan, E., & Khairany, S. (2024). Enhancing Consumer Engagement through Kansei Engineering: A Novel Approach to Sago Rice Packaging Design. *Jurnal Teknologi Dan Manajemen Agroindustri*, 13(1), 36–53.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, 20(1), 141–151.

Kotler, P. (2001). *Managing and Delivering Marketing Programs*. Pearson Custom Publishing.

Kurniati, W. D. (2016). *Packaging Design of Natural Beverage Based on Kansei Engineering and Customer Attitudes: A Case in CTC Black Tea Powder*. Institut Pertanian Bogor.

Lokman, A. M. (2010). Design and emotion: the kansei engineering. *Malaysian Journal of Computing*, 1(1), 1–11.

Mabrurrotin, M., & Suryadi, A. (2025). Redegin Of The Packaging Dedign Of Tempe-Sagu Chips Products Based On Customer Preferences Using Kansei Engineering And The Kano Model. *Indonesian Interdisciplinary Journal of Sharia Economics*, 8(1), 429–445.

Mahera, D. (2021). Perancangan Kemasan Kopi Menggunakan Metode Kansei Engineering (Studi Kasus: Usaha Kopi Angkot Malang). Universitas Brawijaya.

Meida, L. A. (2019). Kajian User Interface untuk Sistem Informasi Akademik PASIM Menggunakan Pendekatan Kansei Engineering. *Jurnal Ilmu Komputer*, 10(2), 8–49.

Miftahuluddin, A. (2018). Rancang bangun alat sistem keamanan sensor pada rumah/bangunan dengan menggunakan metode kansei engineering dan morphological chart. *Jurnal Teknik Industri Universitas Tanjungpura*, 2(3), 7–13.

Mustaniroh, S. A., Mulyarto, A. R., & Nurkhasanah, S. (2011). Analisis positioning keripik kentang dengan pendekatan metode multi dimensional scalling di Kota Batu. *AGROINTEK*, 5(2), 98–106.

Nagamachi, M. (1995). Kansei Engineering: A new ergonomic consumer oriented technology for product development. *International Journal of Industrial Ergonomics*, 15(1), 3–11. [https://doi.org/10.1016/0169-8141\(95\)90025-X](https://doi.org/10.1016/0169-8141(95)90025-X)

Nagamachi, M. (2011). Kansei/Affective Engineering. In *CRC Press*. <https://doi.org/10.1201/ebk1439821336-5>

Nagamachi, M., & Lokman, A. M. (2011). *Innovations of Kansei Engineering*. CRC Press.

Sari, N. P., Hafidah, E., Rizwan, R., & Andriyani, S. Z. P. (2023). Perancangan desain kemasan bakso goreng (basreng) dengan metode kansei engineering. *Jurnal Performa: Media Ilmiah Teknik Industri*, 22(2), 109–121. <https://doi.org/10.20961/performa.22.2.80674>

Sarvina, Y. (2017). Pemanfaatan Software Open Source “R” Untuk Penelitian Agroklimat. *Informatika Pertanian*, 26(1), 23–30. <https://doi.org/10.21082/ip.v26n1.2017.p23-30>

Sukendra, I. K., & Atmaja, I. K. S. (2020). Instrumen penelitian. In *Mahameru Press*.

Syahputra, I., & Sari, N. P. (2021). Perancangan desain kemasan produk rengginang menggunakan metode kansei engineering (studi kasus : umkm rengginang

capit). *Printing and Packaging Technology of Journal*, 2(1), 1–13.