



Product Development using Kansei Engineering to Re-design New Food Packaging

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Abstract

In the era of high market competition, product development must implement excellent innovation and responsiveness toward customer needs. One of the tools that had been successfully applied to support this objective is Kansei Engineering. Kansei is a Japanese word that refers to perception, impression, and feeling. Kansei Engineering is the process to collect product information based on the psychological emotions and feelings of customers. These represent customers' general impressions and emotions towards certain products or services which are then translated into characteristic designs. In this research, the researcher uses the Kansai engineering is applied to design a new packaging for West Sumatra Sanjai Chips produced by a local small-medium enterprise (SME). In processing the data, the researcher carried out a sampling technique, determining the number of respondents with the number of respondents being 100 in the first stage and 15 respondents in the second stage. From the first stage, eight Kansei words were collected. Followed by the second stage which was able to classify the most significant Kansei words based on the customer opinions. It was demonstrated from the investigation that new packaging was designed. With the new design it is expected that customers will become more aware and attracted to purchase the product.

Keywords: Product Development, Kansei Engineering, Small Medium Enterprise, New Packaging Design, West Sumatra Sanjai Chips.

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1. Introduction

In the era of global competition, product development must implement excellent innovation and responsiveness to customer needs, moreover, these are key factors for the success of a product [1,2]. Product development must also focus on the customer needs are constantly evolving and increasingly demanding a lot of customization [3].

Product development is a series that starts from an analysis of market perceptions and opportunities and then ends with the production stage of sales and product delivery to customers [4,5]. In the form of finished products, semi-finished products, components, assembling, sub-assembly or product raw materials.

Product development can be referred to as a stage of activity that starts by analysing the perception, sales, and delivery of the product [6,7]. Six phases in the generic development process in general, namely planning, concept development, product system-level design, detailed design, testing and evaluation, and production ramp-up [8].

Kansei engineering technique in developing customer experience via design. This style of engineering is utilized to generate product aesthetic and ergonomic features that explain consumer emotional experiences [9].

A product development investigation performed by Chiu [10] applied Kansei Engineering and text mining. The investigation used road bikes as the case study. The design determinants are classified into six significant features. The framework was used to reduce the time and cost of product design through automation.

Another work which applied KE was done by Gan [11]. KE is combined with a deep convolutional generative adversarial network (DCGAN) to perform product development for social robot design. Evaluation of aesthetic and emotional appearance preferences is first adopted by the KE method. The goal is to identify key characteristics, which are divided into two categories. The first is physical properties and colour for aesthetic sense. The second category is emotional features.

KE and deep learning were applied to product development, especially on concept generation which covers data set gathering, pre-processing, emotional preference detection, conceptual image generation models, and product-style transfer networks. The case study selected was hand drill design and bicycle helmet design [12].

A product development study by Quan [13] applied KE and deep learning. The combined method was able to execute a plotting model amongst product properties and styles. Furthermore, it could reconstruct and merge colour and pattern features of the style image, which are then migrated to the target product. According to KE analysis, the semantics of the new product has been

extended based on the target product, which allows the design of the new product to better meet the needs of the user. The application of this proposed method is through a case study of women's coat design.

Kansei Engineering (KE) and the analytic hierarchy process (AHP) were used to conduct a product evaluation system by constructing a comprehensive product evaluation system [14]. The case study is to classify some modern chair evaluation indexes. The KE and AHP methods proposed in this study are reliable and effective and can be used for product evaluation to determine product popularity and improve product competitiveness.

Packaging design has many effects on customer perception of a product. Work done in [15] suggested that packaging development allows designers to add transparent elements and consumers can see them directly before buying a product. This work investigated the impact on food images and packaging design with transparent elements. It is suggested that guidelines for designers and brands are also provided on how to take advantage of the viewing effects of these foods.

The review done in [16] stated that packaging is not just a convenient way to get a product to the store/consumer intact. It is mentioned the recognition that product packaging is a powerful marketing tool and therefore requires the same attention and techniques as other areas of marketing to maximize business success. Therefore, the impact of packaging design should be very important to designers, marketers and brand managers. It is estimated that more than three-quarters of food/beverage purchase decisions are made at the point of sale. Consumers need to find, rate and compare the products they want from a variety of products in the store.

The paper completed by [17] mentioned that many packaging design options and parameters must be considered to ensure that the packaging conveys the most effective message, and captures the attention of consumers in-store. It can realise its full potential as a tool to enhance product knowledge. The outlook of food triggers a variety of neural and physiological responses, including increased hunger, more favourable taste ratings, and activation of reward networks.

Festila and Chrysochou in [18] studied the packaging design elements used by food companies for their healthy food products. They have used content analysis of the packaging design of 12 types of food products in two countries which are Denmark and the United States. The results informed that; implicit design elements of

packaging (colour, image, material and shape) differ between healthy and conventionally manufactured products. Other results indicated that these differences are specific to a product category rather than common. It is expected that the results contribute to the knowledge of the use of packaging design as a health communication tool.

The concept of packaging sustainability has evolved with the increasing integration of sustainability principles. Difficulties such as the complexity of the value chain due to the economic, social and environmental demands of sustainable behaviour and the undesirable attitudes of consumers can prevent companies from applying more sustainable packaging. Therefore, the market for enhanced shelf life packages is never exhausted. However, next-generation sustainable solutions can be facilitated by efforts to encourage consumers' positive attitudes towards sustainable packaging [19].

The method of designing merchandise with the usage of KE encompasses: (1) accumulating Kansei records from customers in a particular product area the usage of psychological measurements; (2) analysing Kansei records to make clear the Kansei structure; (3) decoding the analysed records and moving the records to the brand new product area; and (4) designing a brand new Kansei product [20]. To acquire a Kansei product innovatively, collaboration among product designers and Kansei engineers. The collaboration can achieve a fantastic product which is the end result of the analysis of the Kansei data, as depicted in Figure 1

Kansei Engineering (KE) changed into first delivered with the aid of using Mitsuo Nagamachi as a brand new ergonomic generation in product layout. The KE approach interprets consumers' emotions into layout specifications [20]. It is indicated that the foremost implementation of KE entails many steps that permit the utilisation of techniques derived from diverse fields of study, along with marketing, psychology, and statistics [21], [22].

In this study, West Sumatra Sanjai Chips is presented as the case study. This product is very popular in this region and is commonly known as local cuisine. This cuisine is produced by a local Small Medium Enterprise (SME) namely Sanjai Nina. The current packaging of this food is not so marketable and quite dull. The objective of this study is to re-design the packaging so customers will find it attractive, and eye-catching and hence they will be more eager to purchase.

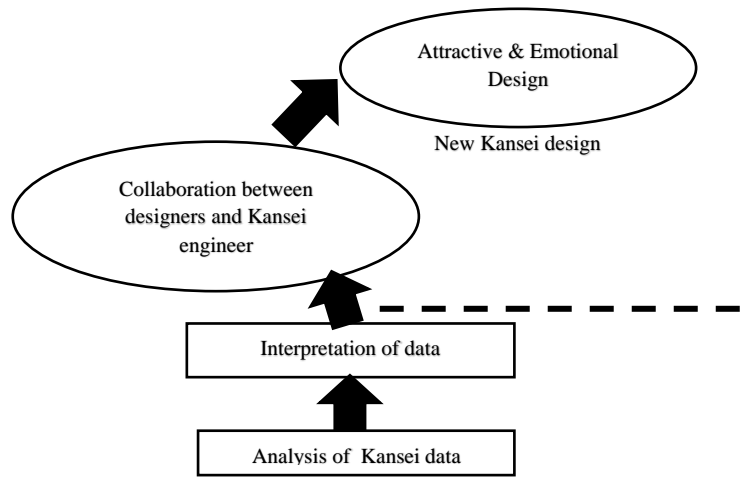


Figure 1. Collaboration between designer and Kansei engineering in product development [20]

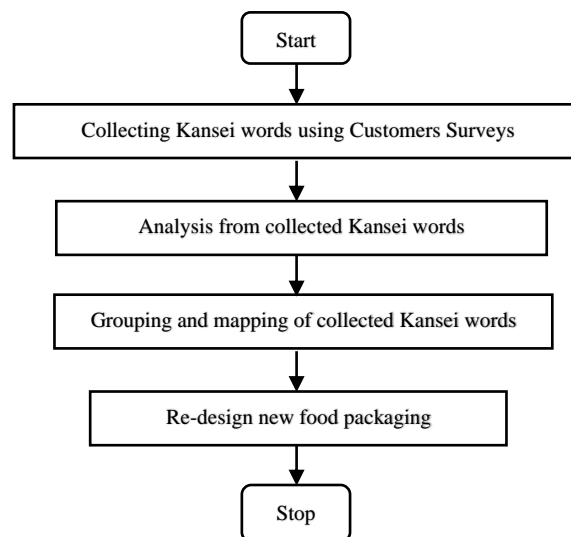


Figure 2. Flowchart of the Research Methodology

2. Research Method

KE initial data collection was carried out by interviewing the owner of SME Sanjai Nina. The next process of collecting Kansei words was carried out by distributing questionnaires to 100 visitors and respondents from Sanjai Nina customers. In the process of collecting Kansei design words, the respondents gave their opinions about the current packaging design and their recommendations to improve the packaging.

The method of the study used the Kansei Engineering approach as shown in the flowchart (Figure 2).

From the first phase, significant Kansei words grouping was derived. These words became the foundation for the second phase of KE which was to perform a semantic differential questionnaire. The questionnaire was given to respondents who already knew well the packaging. The purpose of the questionnaire was to determine the

ranking or the respondent's assessment to the stimulus that was paired with the Kansei words. The questionnaire was distributed to 15 respondents who are regular customers of Sanjai Nina.

3. Result and Discussion

The product packaging in Figure 3 is an image of the packaging that has not been redesigned. The materials used are plastic which contains hazardous materials, the packaging colours are too plain and unattractive, and the labels are not clear. Further improvement is required at this point. At the KE initial stage, the current packaging design was used to collect information to form the Kansei words.

Discussion is the basic explanation, relationship and generalization shown by the results. The description answers the research questions. If there are dubious results, then show them objectively.



Figure 3. Current Packaging Design

Through the first phase, Kansei words were collected. The grouping of Kansei words that contain the same meaning will be reduced in the number of variables to make it easier to carry out the analysis. Kansei word

grouping is done by combining Kansei words that have the same meaning. The grouping of Kansei words that have the same meaning can be seen in Table 1.

Table 1. KE words collected through the first interview phase

No.	Kansei Words	Grouping of Kansei Words
1.	Logo is easy to remember	
2.	Halal Description	
3.	Composition	
4.	There is a Home Industry Product Permit	Information on the packaging (informativeness)
5.	There is a production address	
6.	Expiration statement	
7.	Clear writing	
8.	Can be opened and closed (Zip lock)	Practicality
9.	Easy to store	
10.	Simple	
11.	The packaging material is harmless	
12.	Airtight	
13.	Waterproof	Safety
14.	Not easy to tear	
15.	Character	
16.	Unique Design	Label type (logo uniqueness)
17.	Logo is not superfluous	
18.	Different from the others	
19.	Good use of colour	
20.	Colour variations	
21.	Lack of colour	Packaging colour (colour features)
22.	Bright colour	
23.	Flashy colours	
24.	Plain	
25.	Modern design	
26.	Easy to remember	Logo style (design features)
27.	Many design attributes	
28.	Lots of pictures	
29.	Easily decomposed materials	
30.	Durable material	Packaging material
31.	Disposable	
32.	Reusable	
33.	Neat packing	
34.	Neat logo print	Neatness
35.	Not many wrinkles on the packaging	

The result of the semantic differential questionnaire is presented in Table 2. It is indicated that the grouping can be categorized into main packaging features, namely; packaging material, packaging material, packaging colour, label type, label colour, logo style,

and information on the packaging. Respectively on each main feature, the specific features were determined. The highest specific feature with the greatest number of respondents is highlighted in bold. The new design of the packaging was developed using these features.

Table 2. KE words collected through the second interview phase

No.	Main packaging features	Specific features	Number of respondents
1	Packaging material	Plastic packaging material	11
		Aluminum foil	2
		Plastic and aluminum foil	2
		Paper board	0
		Gradation packaging colour	1
2	Packaging colour	Combination of 2 colours	13
		3 colours mix	1
		Mix of many colours	1
3	Label type	Packaging print	14
		Card Paper	1
		Black and white	1
4	Label colour	2 bright colours	2
		3 bright colours	11
		More than 3 bright colours	1
5	Logo style	Logo with motif	14
		Plain	1
		Halal label	4
		Legalization label	0
		Composition	4
6	Information on the packaging	Expired date	3
		Company Logo	2
		Production place	2

At this stage, the packaging design obtained from the previous stage will be carried out by collecting the Kansei word stage. Packaging designs made by researchers have been conceptualized from the results of the Kansei word stages. The most significant Kansei words based on the respondent's answers are; packaging

material using plastic, the colour of packaging using a combination of two colours, type of label using print labelling, the colour of a label using a combination of three bright colours, design with logo, description of packaging including halal label and composition. The new packaging design for the Sanjai Nina chips can be seen in Figure 4.



Figure 4. Redesign of Nina's Sanjai Chips Packaging

Besides the significant features based on the Kansei words, additional features were added including food and also the new packaging design has complete safety with a zip opening if food still has leftovers it can

be stored again without damaging the texture of the food information such as halal labels, food composition, place

of production and expiration date that makes it easier for consumers to find the correct information.

4. Conclusion

The purpose of this research is to produce a new design for food packaging which is the West Sumatra Sanjai Chips. Based on the first survey at the initial phase six most significant Kansei words describing the packaging were obtained. From the second phase using person to the personal interview, the Kansei words were more specified. The most significant Kansei words based on the respondents' answers are; packaging material using plastic, the colour of packaging using a combination of two colours, type of label using print labelling, the colour of a label using a combination of three bright colours, design with logo, description of packaging including halal label and composition. Hence the new packaging was designed based on the Kansei words as mentioned. With the new design, it is expected that customers will become more aware and attracted to purchase the product. For future work, it is recommended to verify the new design using a validation method, which can confirm that the new design can have a good impact on the sales volume.

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