

DESIGN AND DEVELOPMENT OF AIR FRESHENER'S CASING BY USING KANSEI ENGINEERING AND KANO MODEL



BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PROCESS AND TECHNOLOGY) WITH HONOURS

2022



Faculty of Mechanical and Manufacturing Engineering Technology

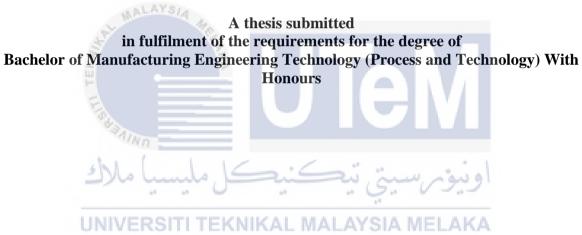


Nadiah Binti Zolkeflee

Bachelor of Manufacturing Engineering Technology (Process and Technology) With Honours

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NADIAH BINTI ZOLKEFLEE



Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I declare that this thesis entitled "Design And Development of Air Freshenre's Casing By Using Kansei Engineering" is the result of my own research except as cited in the references. The choose an item has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



APPROVAL

I hereby declare that I have checked this thesis, and, in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honors.

Signature : Supervisor Name Ts. Dr. Kamarul Bin Amir Mohamed Ts. Dr. Kamarul Bin Amir Mohamed, CEng MIMechE Date 27/1/2022 Senior Lecturer Faculty of Mechanical and Manufacturing Engineering Technology Universiti Teknikal Malaysia Melaka TEKNIKAL MALAYSIA MELAKA UNIVERSITI

DEDICATION

This report is dedicated to my beloved parents in particular, for their endless love, support and encouragement. To my lecturer Ts. Dr Kamarul Bin Amir Mohamed who has guided me along the way to finish this project. Thank you for your support and give me strength until this project is finished.



ABSTRACT

Most of the design concepts available in the market come from the ideas of designers who sometimes have opinions that are contrary to the definition of custom design concepts and as a result, it is always confusing. The purpose of this research conducted is to improve the design of air freshener casing that meets customer demand by using Kansei Engineering. Kansei Engineering is a tool used to interpret human feelings and opinions from users or customers into design parameters. The result of this study is the design of the air freshener casing, which satisfies the psychological feelings of the customers. With reference to the main objectives in this research, three objectives have been proposed. First, to study Kansei engineering and Kano model in air freshener's casing product design. The second objective was to analyse data using questionnaires by applying Kansei word embedding with the Kano model. The final objective of this study was to develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with the Kano model (satisfaction). The Kansei survey consists of two parts. In the first part, a pre-survey was conducted to collect data on customer preferences for air freshener products available in the market. With reference to the highest scores from the survey for each question related to Kansei Engineering, it will be used in the main survey phase. A second survey was conducted to collect data on customer thought and opinions regarding the products selected in the presurvey. To analyze the results in the second survey, use the SPSS software to find correlations between the two variables. Successful results were obtained, by using morphological chat to construct 3 concept designs for the new design of the air freshener casing. The final product of the air fresheners causing was chosen using the Pugh method, which is a process for ranking the three concepts, with concept design no 2 receiving the highest score. . . 0 10 .. 0.. 6 - an

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ABSTRAK

Kebanyakan konsep reka bentuk yang terdapat di pasaran datangnya daripada idea pereka yang kadangkala mempunyai pendapat yang bertentangan dengan definisi konsep reka bentuk tersuai dan akibatnya ia sentiasa mengelirukan. Tujuan penyelidikan ini dijalankan adalah untuk menambah baik reka bentuk selongsong penyegar udara yang memenuhi permintaan pelanggan dengan menggunakan Kansei Engineering. Kansei Engineering ialah alat yang digunakan untuk mentafsir perasaan dan pendapat manusia daripada pengguna atau pelanggan ke dalam parameter reka bentuk. Hasil kajian ini adalah reka bentuk selongsong penyegar udara, yang memenuhi perasaan psikologi pelanggan. Merujuk kepada objektif utama dalam penyelidikan ini, tiga objektif telah dicadangkan. Pertama, untuk mengkaji kejuruteraan Kansei dan model Kano dalam reka bentuk produk sarung penyegar udara. Objektif kedua ialah menganalisis data menggunakan soal selidik dengan mengaplikasikan benam perkataan Kansei dengan model Kano. Objektif akhir kajian ini adalah untuk membangunkan prototaip 3D reka bentuk penyegar udara menggunakan kejuruteraan Kansei (emosi) yang disematkan dengan model Kano (kepuasan). Tinjauan Kansei terdiri daripada dua bahagian. Pada bahagian pertama, pra-kaji selidik telah dijalankan untuk mengumpul data tentang pilihan pelanggan terhadap produk penyegar udara yang terdapat di pasaran. Dengan merujuk kepada markah tertinggi daripada tinjauan bagi setiap soalan berkaitan Kejuruteraan Kansei, ia akan digunakan dalam fasa tinjauan utama. Tinjauan kedua telah dijalankan untuk mengumpul data tentang pemikiran dan pendapat pelanggan mengenai produk yang dipilih dalam pra-kaji selidik. Untuk menganalisis keputusan dalam tinjauan kedua, gunakan perisian SPSS untuk mencari korelasi antara dua pembolehubah. Keputusan yang berjaya diperolehi, dengan menggunakan sembang morfologi untuk membina 3 reka bentuk konsep untuk reka bentuk baharu selongsong penyegar udara. Produk akhir penyegar udara yang menyebabkan telah dipilih menggunakan kaedah Pugh, iaitu satu proses pemeringkatan ketiga-tiga konsep, dengan reka bentuk konsep no 2 menerima markah tertinggi.

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CHAPTER 1

INTRODUCTION

1.1 Background

In the few years ago before industry know about how getting customers satisfaction, usually designer will do the design by thinking it themselves. Sometime the design quite often does not usually meet great approval in the market. Furthermore, product designers are struggling searching to get a greater understanding of the individual feelings of users. In term of innovative product growth, the modern era is moving from a product-out to a market-in approach. It amplifies the user's needs to the same level as the other technical requirements of a good business marketing (A. M. Lokman, 2009). Consumer satisfaction is described as a consumer's attitudes, research, and emotional reaction after a purchase based on a combination of a product's actual output feeling with the hope and evaluation experience of purchasing a product. Apart from that, company royalty is often a mentality and consumers' attachment, or belief based on feelings of enjoyment, popularity, and proud in being a customer of the famous brand. (A. M. Lokman & Aziz, 2010)

It is difficult to estimate implied demand because users' feelings are more difficult to quantify than over needs, which are easier to explain. Kansei engineering is a method that can used to evaluate feeling and impression of customers about a product (Schütte et al., 2004). Kansei engineering was invented by Nagamachi at Hiroshima University about 30 years ago, for a new product development (Matsubara & Nagamachi, 1997). Kansei engineering method can interpret customer's feeling and opinion into a data set that make easier to product designer know well about customer's demand. The aim in this method is

to get customers' opinion about existing product then produce new design or new product in market (Nagamachi, 1999).

Many product that applies Kansei engineering were sold well in Japan(A. Lokman, 2010). With this method become a main aim of research to collect customer's opinion or feeling about the design of automatic spray air freshener. Most of the house, office, and hotels in Malaysia have air freshener. The main purpose air freshener place in enclosure room such as kitchen, living room and bedroom is to reduce the unpleasant odor in house (Alshaer et al., 2019). There have many types of air freshener can be use such as spray, gel form and evaporative diffuser. Most of the user prefer an attractive design for air freshener as decoration. So far, there has not been a version of an automatic air freshener that uses the Kansei approach based on current literature. So, this research is performed to evaluate the users emotional then transfer it into the design elements combined with emotion influence to improve an automatic air freshener. Figure 1.1 shows the concept of Kansei Engineering generally.

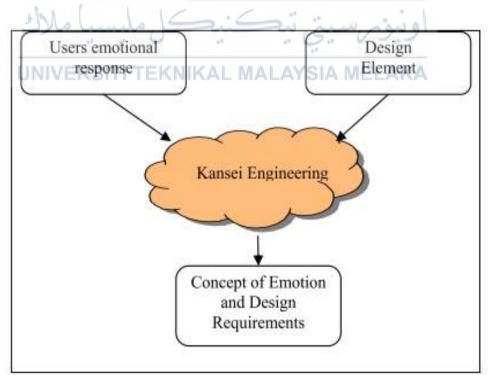


Figure 1. 1 Concept of Kansei Engineeering (Nagamachi, 2003).

1.2 Problem Statement

There have several techniques can be applied to improve product as well as sell Kansei engineering is one of them. Moreover, Kansei Engineering is not a popular method used in Malaysia.

Air freshener is one of essential need in every house. Users look for appearance of casing air freshener then the scents. Most air freshener existing in market do not have an attractive design. Design that seller produce does not have decoration friendly. The production more focus on function of the air freshener. Some users need a new design of air freshener that can fit their interior decoration.

To find out the suitable product for users, should be given opportunity for users to select their own desire design for air freshener by applying Kansei engineering element during the survey. In addition, the product development of air freshener casing also will be referring customers opinion and feelings. Usually, designer or home fragrance manufacturer do not focus on the outer design but the smell of fragrance.

1.3 Research Objective

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In this research have three main objectives need to be achieve at the end of this research:

- To study on Kansei engineering and Kano model in air freshener's casing product design.
- To analyze data using questionnaires by applying Kansei word embedding with Kano model
- 3. To develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction).

1.4 Scope of Research

This research is mainly to study Kansei engineering and Kano model method in order to improve existing product which is air freshener casing. So, in the end of this research the acceptable design and decoration friendly of outer casing for air freshener.

Relation between customer's desire, feeling and judgement with the product will be study further about Kansei Engineering in product development. As to collect the selected sample from users that related to domain product air freshener is using google from. Same as data collection for sentiment survey is using google form. Result from sentiment survey will analyze using SPSS software to getting the correlation between adjective opinion to the product.

Designing air freshener casing that have attractive appearance without change the function and relevant. Solidwork is applied when getting finalize relevant design for new design. Finally, running final survey about getting the opinions from users.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, will be discussing about the literature review studies. It will explain the summary based on previous study that has a better experience. Besides, the basic theory that has relations with research that will be explained regarding the basic theory that has connections with research that would be done from textbooks and other resources is discussed in a literature review. The purpose of this chapter is to find out the difference between previous study with the research that would be conducted.

2.2 Consumers Demand in Product Development

Consumers are the most important factor in the development of new products and determining product success requires an awareness of customer desires. Consumer interest in product growth, on the other hand, does not necessarily provide the desired results; however, contact with customers may mitigate the unexpected and generate foresight to help address potential consumer needs (Booz, 1982). Customer orientation is critical for a market orientation approach, and different approaches have been used to determine consumer needs. Nonetheless, a competitive economy with a large number of customers necessitates special measures to comprehend customer demand for new product growth.

New Product Development (NPD) refers to a company's operations that result in a continuous stream of new or modified product retail offerings over time. This includes the creation of opportunities, their collection and transformation into objects (manufactured products) and activities (services) for customers, as well as improving institutionalization of

new product development activities (Bangad, 2010). Successful innovative technologies are a critical component to a company's development and productivity. And so, not all new products can succeed on the business; for example, the probability of a new product loss is balanced against the potential for economic growth.

Even though the risk is embedded in new product development, it can be quantified by using a formal method for handling new product behaviors. Figure 2.1 illustrates the Booz, Allen and Hamilton's New Product Process, which separates new product creation into seven stages: Idea generation, screening and evaluation, business analysis, development, testing, and commercialization are all steps in the development of a new product strategy (Booz, 1982).

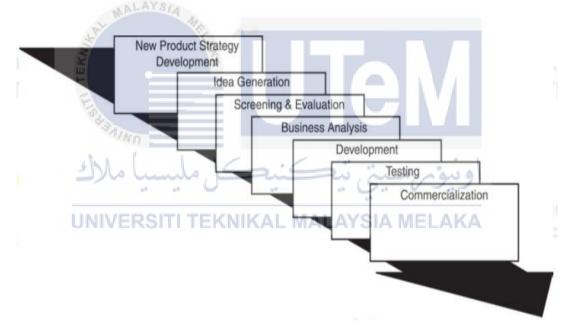


Figure 2.1 New Product Process (Booz, 1982).

In the first stage is new product development. Creating the framework for the new product development process by evaluating missions and related objectives, as well as identifying roles that new products could play in achieving specific goals. This material highlights the strategic needs for new product as a guide for following stages of product innovation. Generate the idea is the second step in the process of developing a new product. In order to discover a suitable and useful concept, an organization would usually produce a lot of them. The most creative companies also use a variety of sources of inspiration from emerging products, as well as a variety of methods to process such ideas. They must also boost employee ingenuity in order to operate the pipeline that feeds innovative product design and production(Bangad, 2010).

Idea screening is the following step after getting the list of idea. In this stage This is the first evaluation of a modern product concept. It entails filtering new product concepts in order to identify the best ones and exclude the bad ones as quickly as possible. Only concept concepts that will turn into useful goods are used in this process. The concept of development and testing. At this point, the product concept is transformed into a verbal or visual representation, with initial ideas for impediments, products, and technologies. Furthermore, emerging design ideas were checked with prototypes of potential audiences in idea testing to see whether they had a good impact on them.

Marketing strategy and business analysis is involves developing an initial marketing plan for a new product based on the product idea. The marketing campaign statements are split into three sections which are an overview of the target market, the expected product placement, as well as revenue, market share, and benefit (Booz, 1982). This provides a study of new product revenue, prices, and earnings estimates in order to determine if these aspects meet the firm's goals.

Product development phase in this phase it involves the assembly of all the component and other works that related (Booz, 1982). It will transform into tangible shape and samples in this section to ensure that the product theory can be turned into an actual product.

Marketing testing is the process when the product prototype and marketing division was simulated in a more practical and real-time business scheme at this point of new product growth.

Commercialization is the final stage. This section simply refers to the launch of a new product into the industry using some campaign advertising tactic. A new product may be sold quickly, exclusively, or carefully in order to promote it(Bangad, 2010).

2.2.1 Kansei Engineering

Kansei Engineering (KE) is one of method product development process which related to consumer emotion and opinion. By referring to Japanese word Kansei means consumer's emotional feeling and image about a product(Nagamachi, 2003). Kansei Engineering is mostly used as a catalyst for the systemic development of new and creative ideas, but it can also be used to enhance current products and concepts (Zhabiz Shafieyoun, 2014). The study of product emotion has shown that emotional design outshines useful and usable design. Figure 2.2 shows the Kansei Engineering system(Neto, 2015).

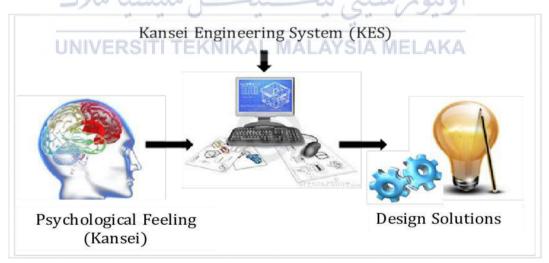


Figure 2. 2 The Kansei Engineering System (Neto, 2015).

The idea for a new product can be design according to customer's feeling and image by applying Kansei Engineering technology. According to the definition of Kansei Engineering from Nagamachi " translating technology of a consumer's feeling (Kansei in Japanese) of the product to the design elements (Nagamachi, 1999). Kansei Engineering is an evaluation about some product in form of subjective comment or perception by referring to the interaction between the purpose or experience. In total, Kansei Engineering (KE) has become a strong product and service design technique that collects and converts potential users' and customers' emotional demands and sentiments into customer experience design features and features.

2.3.1 Definition of Kansei

In Japanese culture, the word Kansei is difficult to translate to the other language. Kansei is referred to as sensitivity, sensibility, and feeling in certain dictionaries, while having varying meanings from different literature, including sensitivity, meaning, sensibility, feeling, aesthetic, sentiment, love, and intuition in English(Neto, 2015).

In term psychology, Kansei can be define as the mental state this is knowledge, emotion, and sentiment are synchronized. Those people who rich Kansei is people full of emotion and sentiment adaptive as well as warm and responsive. The closest word to Kansei is 'psychology feeling' people have with a product. Emotion is described in its psychological school of thinking as unconscious thoughts about objects, and this definition is similar to the Kansei principle.

The change of era there have revolution in design in some industry like fashion, decoration, building and etcetera. So, Kansei is reflection of the era and change occasionally such as trend related. Furthermore, differences in Kansei can occur as a result of differences in culture and social behavior between individuals and nations, and there are Kansei that are nearly identical but vary in terms of the Kansei words represented. As a result, when applying K.E. abroad, topics such as culture and timeliness are some of the sensitive matters that must be considered.

2.3.2 Kansei Engineering Invention

Professor Misuto Nagamachi of Hiroshima University invented the system in Japan in the early 1970's, as a consumer-oriented technology for new product development and it has since been applied by a lot of Japanese firms (Nagamachi, 2003). The method became popular in the United States and Europe in the mid-1990's. Kansei Engineering has progressed significantly in its three decades of existence.

Nowadays, many products were invented by using Kansei Engineering technology method. As a great example, a Japanese automotive manufacturer, Mazda using Kansei Engineering to develop a new sports car named "Mitaya'.

The main purpose of Kansei Engineering to innovate and produced a new product based on the feelings and demands of customers. To proceed with this method there have four points that concerning(Nagamachi, 2003). First, to understand the customer's feelings (Kansei) regarding the goods in terms of economic and psychological evaluation. Second is how to figure out the product's design features from the Kansei of the customer. Third is how to make Kansei Engineering a user-friendly technology. Lastly, what to do to adapt product design to contemporary cultural shifts or consumer preferences

2.3.3 Kansei Mechanism

Kansei refers to the psychological state in which knowledge, feeling, and sentiment are in balance. Kansei as a mental function, most exactly as a deeper mental function according to Harada (Anitawati, 2009). As a result, it is an implicit function of the brain. Kansei begins with the five senses acquiring sensory functions such as sensations, emotions, and intuition (i.e., vision, hearing, smell, taste, and skin sensation). Psychological brain function involving perception, judgement, and memory will emerge when these senses are aroused. In the case of entering a new boutique, your senses of sight, smell, fashion style, and cognition would determine if the establishment were "very welcoming" or provides "excellent service ". Figure 2.3 shows the process of Kansei in form of brain sensory (A. Lokman, 2010).

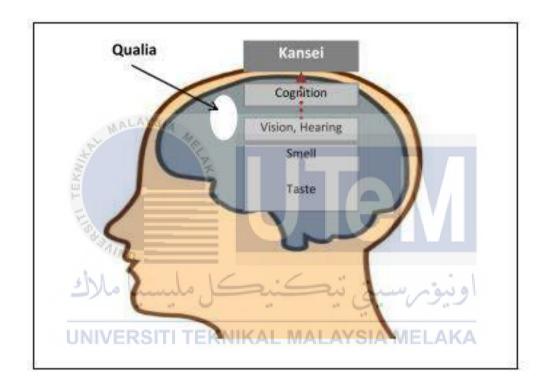


Figure 2. 3 The Process of Kansei (A. Lokman, 2010)

2.3.4 Concept of Kansei Engineering

Kansei Engineering attempts to develop a modern product focused on the feelings and demands of consumers. Kansei can be explained using the human brain as a model and our brain creates interest, feelings, and emotion, which are known as Kansei. Regarding this method, there are four things to consider which is, first is how to grasp the consumer's feeling about the product in term of psychological estimation. Second, the way to identify and analyze the product's design feature from the Kansei of the customer. Third, how to build Kansei Engineering as an ergonomic and update technology. Lastly, fourth is how to adapt product design to new cultural changes or consumer preferences. Figure 2.4 shows Concept of Kansei Engineering (Chuah et al., 2008).

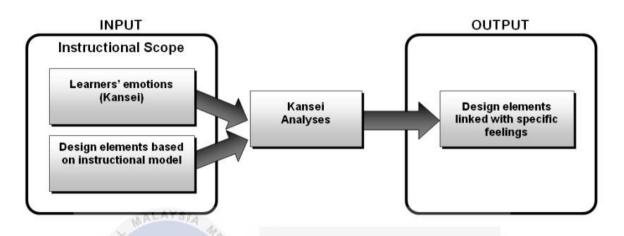


Figure 2. 4 Concept of Kansei Engineering (Chuah et al., 2008).

2.3.5 Type of Kansei

Nagamachi discovered six different varieties of Kansei Engineering procedures have now been checked and are ready for use (Neto, 2015). Table 2.1 below show the type of Kansei Engineering that currently available.

Table 2.1	Type of Kansei	Engineering System	(Anitawati, 2009)
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Туре	Type Name	Description
Ι	Category classification	• Identifying the design elements of the product to
		be developed, translated from consumer's
		feelings and image.
II	Kansei Engineering System	• A computer aided system with a so-called
		interference engine and Kansei databases.

III	Kansei Engineering	• Mathematical modelling with an interference
	modelling	engine and databases
IV	Hybrid Kansei Engineering	• The combined computer system or forward
	System	Kansei, which goes from the user's impressions
		to design specifications and vice versa.
V	Virtual Kansei Engineering	• An integration of virtual reality technology and
		Kansei Engineering in a computer system
VI	Collaborative Kansei	• Group work design system utilizing intelligent
	Engineering Designing	software and databases over the internet

WALAYS/4

Kansei Engineering's future development and application to other areas would necessarily require the integration of more technologies and approaches from other fields. Kansei Engineering's future development and application to other areas would require integrating more technologies and approaches from other fields. This might be key to Kansei Engineering's growth.

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2.3.6 Application of Kansei Engineering in Product Development

1. Automotive vehicle design. (Type 1 KE)

Japanese automotive manufacturers wanted to implement Kansei Engineering into the production of automotive vehicles. Nissan, Mazda, and Mitsubishi were ready to apply Kansei Engineering and started producing a variety of newly designed vehicles. Nissan has extended the latest ergonomic technology to all new products. Kansei Engineering was first developed by Mazda for the creation of "Persona" and later for "Miyata". In addition, Mitsubishi practiced Kansei Engineering before any other automobile manufacturer and decided to apply it in the "Diamante," which would have been a success. Toyota and Honda, several other Japanese manufacturers, were also interested in learning about Kansei Engineering Type I and then used it to develop their products. Figure 2.3 shows example translation of Kansei into car physical trade (Nagamachi, 2003).

	Kansei			Physical	Ergonomic	Automotive
Zero	lst	2nd	nth	traits	expriment	engineering
[- Tight feeling		• •	Size Width Height Seat	Tight feeling experiment Interior kansei expeiment	Chassis design Sheet design Interior design
нми-	Direct feeling		•••	Steering design Shift lever	Steering function Shift lever	Power train development Steering yaw ratio
ŀ	Speedy feeling -	14 14		Speed meter	length	Steering design Shift lever design
L	Communication	E		Frequency Open style	Minus gravity Noise frequency analysis	Speed meter design exhaust pipe design

Figure 2. 5 Translation of Kansei into car physical trade (Nagamachi, 2003).

2. Computer assisted KE. (Type II)

The Kansei Engineering is a computerized system that uses the expert system to convert the feeling and image of the customer to the design data. It can be related to Kansei Engineering type II which is is a computer supporting system for designer's designing Kansei product. Figure 2.5 below show the four database of computerized KE system (Nagamachi, 1999).

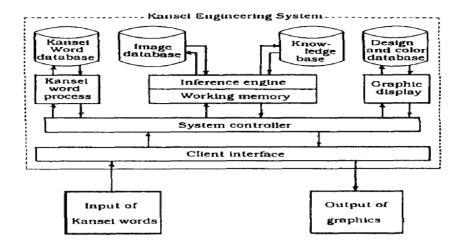


Figure 2. 6 Flow Kansei type ii (Nagamachi, 1999)

Type II Kansei Engineering has been used to create a costume for a college girl, house design, entrance door design, car interior design in Nissan, office chair design, the color planning, interior design in a construction machine, and automatic door design. Knowledge computing tools used by the KES include Expert Systems, Neural Networks, and Genetic Algorithms. Whenever a designer enters his or her Kansei terms into the scheme, the KES calculates them using the inference engine and databases, and then displays a graphic as the result of the calculation.

3. Mathematical modelling (Type III) KAL MALAYSIA MELAKA

Fukushima and his colleagues explain the Type III case in detail. They managed to introduce intelligence into a color printer in order to create a better color image. They performed an experiment in which the participants used the Kansei SD (Semantic differential) scales to rate different girl's face skin colors (Nagamachi, 1999). Figure 2.7 shows example semantic differential scale (Tama et al., 2015). The tested colors were divided into three categories: shade, value, and chroma, which were then represented using a triangle fuzzy membership function. Using the SD scale, we performed an ergonomic study on face color analysis. We succeeded in Kansei realization of making more balanced and beautiful color copy implementing the face color tuning method in the CPU of the new color copy machine. Nagamachi also used a Fuzzy Logic system to model Japanese term feeling (Nagamachi, 1999).

NEGATIVE	1	2	3	4	5	POSITIVE
Affordable, inexpensive						Expensive
Antique, classic		0				Modern, contemporary
Plain						Patterned
Dull		0				Attractive
Ugly						Beautiful
Uncreative		j j	j		5 2	Creative, innovative
Not harmonious						Harmonious
Inclusive		i i				Exclusive
Complex		1				Simple
Not appealing		i i				Appealing, dazzling
Not Aesthetics						Aesthetics
Not inspiring		i i	l l			Inspiring
Untidy						Tidy
Rigid		1	l i			Dynamic
Common						Limited edition

Figure 2. 7 Semantic Differential Scale (Tama et al., 2015)

2.3.7 Kansei Principal

The literature shows that K.E.'s process explanation is mostly summary. Figure 2.8 below shows the outline for principle of KE implementation that is possible in all development cycle for different kinds of product (Anitawati, 2009).

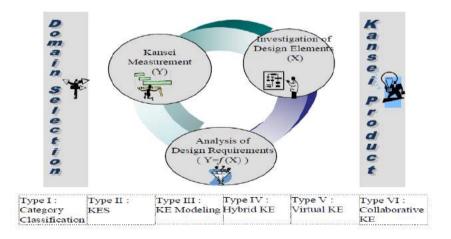


Figure 2.8 Principal of KE (Anitawati, 2009)

In a particular domain, the approach involved the phases of Kansei Measurement, Investigation of Design Elements, and Analysis of Design Requirements, with the aim of producing Kansei products (Anitawati, 2009). At the bottom, various categories of K.E. are arranged to display different types of K.E. techniques. Below states the detail of each component from the main principal.

First, domain product selection during this process, identifying the specific domain product that need to be study using Kansei Engineering technique. Since Kansei answer is unique for different products, it is limited a study to a single domain. As stated above there are six types of KE. Any kind of K.E. to use is determined by the industry's or Kansei Engineer's strategies for completing all processes (Schütte et al., 2004). M.Huang, H.Tsai and T.Huang (2011) applied Delphi method to making a decision by avoiding predicted error as well as less arguments (Huang et al., 2011).

Second is collection of Kansei word. The Kansei word applies to describe the product domain. These words are mostly adjectives, but they may also take other grammatical forms but also verbs and noun can occur. All relevant references must be used to obtain a full set of terms, even though the words that occur appear to be related or identical. Figure 2.9 below represent sample flow of selection Kansei word (Schütte et al., 2004).

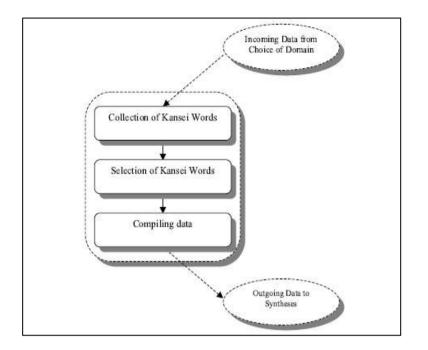


Figure 2. 9 Simple Flow of Selection Kansei word (Schütte et al., 2004).

The number of existing Kansei terms ranges between 50 and 600, depending on the domain in question. Since it is critical to compile all existing words, the process is repeated until no new words appear. If key words are omitted from the report, it would have a significant impact on the quality of the findings.

The third principle is measuring Kansei. The method of capturing a consumer's internal feeling is known as Kansei Measurement. It is difficult to calculate Kansei explicitly since it is subjective, complex, and unstructured. As a result, we must formulate indirect calculation approaches based on a different speech methodology. The list above is sorted according to the complexity of behavioral patterns. Kansei Engineering is focused on analytical product and model property estimations, and it assists consumers in expressing their expectations on items they may not be aware of. As a result, semantic methods such as Osgood et al (1969).'s Semantic Differential Method are used (Schütte et al., 2004).

Forth is collection and selection of product properties. Manual compilation and selection of product features from many products that available in market by the product

designer alone is the most common variant in any designing phase. Functional supports, such as fish-bone diagrams, may be helpful in complicated situations.

Fifth, investigation of Design Element. The method of examining basic design elements such as color, scale, and form of a product is known as investigation of design elements. From a customer perspective about the design concepts must be categorized into their values (Anitawati, 2009).

Sixth is analysis of Design. Most crucial in creating and maintaining a quality Kansei of product are psychological reaction to product design features. This method determines which Kansei is strongly linked to the product design elements in order to decide the design criteria for developing a product that incorporates the target Kansei. Many tools are available to do a data synthesis regarding qualitative and quantitative data. One of the tools can be used to study the data is Minitab application. By using this application, from the data collection can be analyze through linear regression, find the correlation and the standard deviation.

Lastly, model building. The collected data from the simulation can be presented as a model until the validity tests have yielded a satisfying result. Sketching part is the most crucial part as it need to draw the new product by following features have been chosen by users. In 3D modeling, it is suitable to used application Solidwork to draft. And not only one drawing it can be more than one. In previous study, there prepared six sample of drawing to be proposed by expert (Huang et al., 2011).

2.2.2 Data Collection

Usually manually data collection is most common variant for every designing process. But the most quality result for data collection have been done by the expert designer which has may experience that can decide which product that suitable by referring to the parameter will have taken out. Many ways for the designer collect data in this case is Kansei data. Table 2.2 shows the list of data collected ways from previous study.

Bill	Торіс	Data collection method
1	Improvise the design of	Data collection done by distributing
	ceramic souvenir to meet	questionnaires among people in public
	customers desire	places (Tama et al., 2015).
2	Commercial trade show booth	Using Delphi method to achieve multi-
	design for plastic and rubber	opinion in making decision as well as
	industry.	avoiding predicted error and arguments
		(Huang et al., 2011).
3	Systematically emotional	Clarify Kansei image word that reflected
	design method of products', it	emotional from user. Distribute
	also can be used to design mini	questionnaire to target users (Guo et al.,
	digital camera TI TEKNIKAL	2014). The researcher using 5-point SD
		scheme.
4	A walking stick as an older	The method used is Kansei sheet, read body
	Japanese people	language and interview the old Japanese
		people (Elokla & Hirai, 2015).
5	Design for packaging design of	Kansei word were collected from books,
	powder shape freshener	journal, internet etc. then minimizing the
		Kansei word. Finally become as strategies
		of design product based on KW which is

Table 2. 2List of data collection methods

		answer in first objective paper (Djatna &
		Kurniati, 2015).
6	Design in innovative alarm	First find the respondent that agree with the
	clock made from bamboo	innovation. Kansei words were collected
		from 25 respondent by questionnaire
		(Achmad Shergiana, 2015).
7	Developing a new jeans design	From the image sample the designer group
		and selected Kansei word from image jeans
		drawing (Nagamachi et al., 1959).
8	Designing comprehensive ball	The study collected 27 sample of ball pens
	pen	come from different companies. The 24- respondent female student using 5-point SD
		scale measurement to evaluate each pen and
	AINO	consist of 40 Kansei words (Nishino, 2010).
9	Kansei engineering approach	The samples were collected from all type of
	for consumer 's perception of	product from different company. 8 type of
	the ketchup sauce bottle	different sauce bottle with the different
		shape and function used (Mamaghani et al.,
		2014).

From the table above, as conclusion many ways that can be used to collect the data from respondent. There has direct interview with the respondent, questionnaire distribution and using Kansei sheet and reading body language. The method also depends on the product study. The better method nowadays is 5-points SD scheme. And distribute using google form so can getting more respondent to ensure the data is more accurate.

2.2.3 Data Analysis Method

In synthesis data or data analysis, the subjective or Kansei word and product design must link together. The product properties must affect the Kansei word. Nagamachi's work with Kansei Engineering over the last five years has focused on building these ties. There are a variety of quantitative tools accessible at the moment. Table 2.3 shows method that have been used from previous study.

	WALAYS/A	
Bill	Topic	Method
1	Improvise the design of ceramic souvenir to meet customers desire	Data is processed for factor analysis and conjoint analysis using SPSS19.0 software. Factor analysis used to reduce the Kansei word. Conjoint analysis used to find the relationship between Kansei word and the design element. (Tama et al., 2015)
2	Commercial trade show booth design for plastic and rubber industry.	To evaluate the trade shoe design with using fuzzy synthetic assessment method. It conduct assessment of many target using many influence on sample (Huang et al., 2011). The evaluation involved 4 parts : 1. Cluster generation (to assemble)

Table 2. 3Methodology used in previous study

		2. Cluster weighting factors (design
		parameter)
		3. Aim to optimize the sample of all factors
		4. Perform fuzzy evaluation.
3	Systematically emotional	The data is evaluated by using MDS in SPSS
	design method of	18.0 it also includes RSQ (square correlation).
	products', it also can be	To estimate value between the computed result
	used to design mini digital	and observation data, stress value need in
	camera	smaller value. For better result, stress value need
	MALAYSIA	in lower value (Guo et al., 2014).
4	A walking stick as an older	In the study of emotion, the evaluation more
	Japanese people	referring to the user emotion through walking
	The second se	stick by Kansei sheet as well as the interviews
	AINO	revealed the emotions (Elokla & Hirai, 2015).
5	Design for packaging	Quantification theory type 1 (QTT1) is used by
	design of powder shape	Djatna and Taufik (2015) to evaluate the result.
	freshener	This method is known as quantitative and
		categorical multiple regression analysis method.
6	Design in innovative alarm	To analyses the innovation alarm clock is used
	clock made from bamboo	Stuart Maxwell test. This test is to know the
		significant between user need and innovative
		alarm clock. As a result, customers criteria at 5%
		of significant level about the innovative alarm
		clock (Achmad Shergiana, 2015).

7	Developing a new jeans	Analysis data is done by using Viramax method.
	design	This method shows that cumulative contribution
		from several factor which is from Kansei word
		(Nagamachi et al., 1959).
8	Designing comprehensive	Multiple linear regression analysis is used to
	ball pen	analyze the data from questionnaire. Ninshio
		(2010) was proposed multi-level rule extraction
		method for designing to match with Kansei goal
		and development concepts in Kansei
	MALAYSIA	Engineering.
9	Kansei engineering	In this research used statical tool Kaiser-Meyer-
	approach for consumer's	Olkin (KMO) measure of sample adequacy and
	perception of the ketchup	Bartlett's Test of sphericity. KMO statistic
	sauce bottle	should be 0.6 or greater. Bartlett's Test has a p-
	کل ملیسیا ملاك	value less than 0, 0001 showing that there are
	UNIVERSITI TEKNIK	significant bivariate correlations between some
		of the variables (Mamaghani et al., 2014).

As the table 2.3 shows many methods have been used to analyze data from questionnaire. Nagamachi state that in Kansei research statistical method based on mathematical and non-mathematical approaches have been proposed but it depends on the research context.

At present, many applications can be used to analyzed data without difficulty. Minitab is a software that provide an effective way to manipulate data, getting trends and patterns, and conclude answers about current issue. Linear correlation is one of the statistical measure techniques that define the linear of relationship between two quantitative variables. Correlation simply writes as r. The value interval between +1 and -1. If the value is 0 that means, there no relationship.

2.2.4 Literature Study

By referring to the journal with title Development of Customer Oriented Product Design Using Kansei Engineering and Kano Model: Case Study of Ceramic Souvenir Study by Tama, Ishardita Pambudi, Azlia, Wifqi, Hardiningtyas and Dewi the main purpose conducting this research is to enhance the design of ceramic items by researching what consumers desire about ceramic items. In order to meet customer needs, in order to attract the best shoppers' interest. In this study researcher has been apply Kansei Engineering Type I -Category Classification to create ceramics for souvenir items. Following that, the significant Kansei words that influence customer happiness will become design priority for development plans. In order to collect the data, it was distributed a questionnaire with a 5point SD scale score and 20 Kansei words that represented users' emotional responses. The sample size for this research is 40 people. Respondents' personal information and reactions to each graphical sample of ceramic design were included into the questionnaire. Furthermore, this study classifies or categorises Kansei terms from customer choice into Kano Model attributes and maps them into three kinds of customer satisfaction. After that, assisted with the math calculation and statistical analysis. One of the efforts that can be taken to deal with the increasingly competition is through product design. Due to the fact that the appearance of a product is likely to be the initial impression made by buyers, its attraction cannot be separated from its appearance. The aesthetic worth or attractiveness of an item's display is strongly linked to its ability to grab the attention of potential consumers. The result shows that preferred souvenir is a drinking mug / cup with basic parabolic-shaped design, artificial exploration with 2D and textured glaze decoration, as well as coloured blocks (Tama et al., 2015).

This research with title Applying Kansei Engineering to Industrial Machinery Trade Show Booth Design was carried out to assist machinery suppliers by providing a systematic design flow chart and associated criteria for trade show booth planning. This study describes a multiple factor decision-making strategy for trade show design while looking at open days in the plastics and rubber industries. The suggested approach is divided into three sections: (1) Using the Delphi method and Kansei engineering, select acceptable assessment criteria for trade show design., (2) defining acceptable concepts and techniques for booth design for trade exhibitions in the plastics and rubber industries that use fuzzy product placement, (3) improving trade booth design to achieve trade show involvement goals. These professionals interact using the Delphi technique to create assessment criteria for booth design and elements for valuing the aims of trade show participation. Second, to develop picture word datum for describing trade show design, this study uses category categorization. These experts are expected to develop assessment criteria for trade show design, identify samples of good booth design, and verify new design cases. Data used in sample selection by experts are based on 116 sets of booths. The first three highest scores are identified as examples of good booth design. Then the most important task to survey customers preferences using Kansei Engineering. Based on this image word data, experts choose appropriate adjectives to describe trade show design. This study applied the fuzzy synthetic evaluation approach. For the advance assessment, 30 interviewees that divided into two groups including 15 members with mechanical engineering experience and other 15 members with product design experience. These two groups have significance in order to design booth. To summaries the analysis of six samples by 30 interviewees it states that the attributes in designing trade booth are 'very modern', 'simple', 'professional' and 'scientific'; those describing lighting include 'very bright'; and those describing functionality include 'practical', 'convenient', 'comfortable', and 'clean' (Huang et al., 2011).

Emotional Design Method of Product Presented in Multi-Dimensional Variables Based on Kansei Engineering, this journal study presents a Kansei Engineering based systematically emotionally design process for product hard interactions, which may be developed to generate a product that mirrors customers' feelings. Therefore, it is of high necessity to study users' emotional needs aroused by the product's multi-dimensional design variables. The KE models are built using typical paired Kansei image words and multidimensional key design factors acquired using consumer-oriented methodologies. It may be utilised in a variety of design situations to improve the emotional design of a product. The key in technologies and methods of product design, which included Kansei images, describing the product form, identifying form design variables, establishing relationships between Kansei images and the design variables, and developing the product intelligent design. The request study of the target user for the study item is the first step in the KE-based product design. This phase requires collecting as many samples of the research object as possible, and then determining many with various appearance features that may be applied in the next phase after objectives are clearly by a target population. Secondly, certain important Kansei image words are selected out based on the three which was before criteria and the frequency in which users use the words to assess the study item. Third, a questionnaire experiment is used to determine how similar they are. Following the assessment, an averaged comparable matrix was obtained, which MDS in SPSS 18.0 could process RSQ (squared correlation) values in various dimensions. So, the result in this paper is a new mini digital camera have been chosen by decode the binary code. In this paper, there were two disadvantages. First, the research participants were a select group of undergraduates ranging in age from 20 to 32. Secondly, occupation, race, area, and other variables may all have a significant impact on the outcome (Guo et al., 2014).

Evaluation of Assistive Mobility Product for The Japanese Elderly by The Kansei Sheets by Elokla, Nermin, Hirai, Yasuyuki this study applied emotions design methodologies to evaluate the Kansei demands of the Japanese elderly for individual helper items linked to movement. The current design of a walking stick was reviewed from the perspective of elderly individuals in this investigation. The above research was carried out using two different emotional evaluation methods are Kansei sheets and read body language (RBL) sheets. Several issues with the design of walking sticks were found in this study. It emphasized on the current design of the walking stick and its issues as can be seen by users. To assess users' emotions and highlight the most significant design concerns, three emotional assessment methodologies were applied. Kansei sheets, read body language (RBL) sheets, and interviews are some of the methods used. Two sheets represent approximately a Kansei sheet. The first sheet has 14 different emotional reactions. Sheet #2 has nine physical sensations. Sheets #1 and #2 are used to analyze and assess consumers' interior emotional experiences and conscious bodily responses following product/service contact. The user can choose the image/s that best represent his or her emotional state to a product from the two sheets. The user's emotional and bodily responses are measured using a Likert-type scale on the Kansei sheets. Each level of stick design assessments required subjects to apply kansei sheets. The final question was the overall judgement of stick design (reflective level). The

following are the example of evaluating questions for stick designs. Stick appearance/aesthetic evaluation -visceral level (using Kansei sheet # 1): Q.1 What do you feel about handle form? Q.2 What do you feel about foot design form? Stick usability and overall evaluation -behavioural level (using Kansei sheets # 1 and 2): O.6 What do you think about the usability of the stick handle from ergonomics aspect? The findings of both Kansei sheet #1 and the interviews suggested that the subject feelings were mostly favourable when it came to the stick look. Their feelings were divided into two categories: satisfaction and attraction. Three factors, according to the research, might be to reason for the variances. The first possibility is that an observer may fail to see a certain sort of user facial expression known as a "micro-expression." Second, the "universal language of emotion" has been labelled facial expressions. Third, the physical signal theory proposes that two channels trigger physical reactions: emotion, which may alter in the body and is projected to the brain, and cognitive, which represents emotion and may be engaged in the brain without being directly prompted by a physiological reaction. At total the design that need in walking stick are unique soft handle, height adjusting stick, small size for storage, light weight material and attractive elegant design (Elokla & Hirai, 2015).

A journal with title A System Analysis and Design for Packaging Design of Powder Shaped Fresheners Based on Kansei Engineering written by Elokla, Nermin, Hirai, Yasuyuki. The primary goal of this study is to satisfy client preferences and increase sales of tea powder products by creating beautiful packaging by using Kansei Engineering. Kansei Engineering contributed to the development of a new developed product by connecting the required product attributes for customer satisfaction. That is a chance to improve the look of packaging concept and package quality, which will therefore lead to enhanced customer demand, enjoyment, and satisfaction. Packaging design may be stated to have a key influence in influencing a consumer's choice to buy a product. To be capable of influencing a consumer's decision, a package design that is both interesting and unique was necessary. The research's key objective was to determine the design element of package design, to recognize packaging design on Kansei words, and to develop a new packaging design. With analysis and design, the production system that can improve the efficiency and effectiveness in the system especially in order to produce the packaging design of tea powder by using the Kansei engineering method was produced. In methodology, process system development is the first stage of the system approach's evaluation. Throughout this step, the goal is to specify factors in the analytic system in terms of the overall user. Utilizing tools like Sybase Power Designer 16.0, analyse and model business processes using BPMN workflow. The research used BPM AALAYS/ to analyse processes and subprocesses in order to derive an overall process flow. The second step in methodology is element identification. In starting to develop a product design is to identify the product design. In this research, we determine the design of a tea powder item in terms of understanding its design features by collecting tea powder product samples. Then third step is identified product element on Kansei word where it can derive from books, internet, journal etc. Next, the evaluation's results were combined applying the quantification theory type 1 (QTT1) approach. The QTT1 may be thought of as a quantitative and category multiple regression analysis approach that allows for the inclusion of categorical and qualitative independent variables. As a result, bright, modern, straightforward, and eyecatching are the four main categories of tea powder package design on Kansei words (Elokla & Hirai, 2015).

By referring to the journal with title Design of Innovative Alarm Clock Made from Bamboo with Kansei Engineering Approach by Achmad Shergian and Taufiq Immawan. The innovation of alarm clock that made from bamboo as the source of sound is the one

alternative solution of a declining both products. However, due to the impact of the modern toy development, the traditional toys were declined. Othok-othok toys and alarm clock currently are in the declining phase of sales. As a result, the bamboo alarm clock was developed as an alternative to the declining both items. There are different approaches for designing a product, but Kansei Engineering was employed in this study because it can particularly excavate sentiments from customers, resulting in goods that represent sentiments customers. The questionnaire was divided into three sections: Kansei word identification, physical design specification, and physical design parameter evaluation. These important Kansei should be selected as design specifications in the final design. The survey was performed to find Kansei words until a total of 25 people agreed with the idea. The questionnaire consists of three sections: Kansei word identification, physical design specification, and physical design parameter validation. According to the majority of responses, the chosen object best represents traditional design (traditional, creative, unique, and natural). The revolutionary alarm clock was put to the Stuart Maxwell test of marginal homogeneity. The goal of this experiment was to see if there are any major variations between user needs and innovative alarm clocks. As a conclusion in this research paper state that at a 5% significant level, the design unique alarm clock was valid to fulfil consumer criteria. Traditional design and exquisite design were the two elements that split client choices (Achmad Shergiana, 2015)

Next journal titled Kansei Engineering Approach for Consumer's Perception of The Ketchup Sauce Bottle. Same as another research that used Kansei Engineering the method is same. But the number of respondent and Kansei word only different. There were 31 Kansei words chosen, as well as eight distinct types of sauce bottles with various forms and functions. All of the studies took place in Tehran, and 47 persons were included in the study, with 23 men and 24 women varying ages from 20 to 50. To determine the relationships between product attributes and adjectives, a 5-point semantic differential scale was used. These product samples belonged to seven different food products companies. The data in this research were analysed using SPSS software by multivariate statistical techniques such as factor analysis. As generally, the average Kansei answers for each sample have a welldefined distribution. Quality and statistical tools must be integrated with Kansei engineering. The advantage of factor analysis is that all of the variables included play the same function. It is feasible to group replies with similar meaning using a factor analysis on the replies gathered on a certain questionnaire. This cuts down on the number of indicators needed to describe all the replies. At total, the findings show that five elements shape ketchup sauce container samples: visual, personality, operational, distinctive, and fragile (Mamaghani et al., 2014).

The study conducted by Djatna, Taufik, Wrasiati, Luh Putu, Santosa, Ida Bagus Dharma Yoga with title Balinese Aromatherapy Product Development Based on Kansei Engineering and Customer Personality Type. This product is distinctive and well-known in the market because to the blend of aromatherapy and Balinese culture. To produce a new design idea for a Balinese aromatherapy treatment product, three objectives of this study were offered first is to generate the new design concept of Balinese aromatherapy product using Principal Component Analysis (PCA), second to identify the relevant product design element using Relief method, and lastly to generate the quantification model of aromatherapy product design using Fuzzy Quantification Theory Type 1 (FQTT1). From twelve design aspects selected, 10 suitable design components were developed using the Relief approach. Design support data has been developed from these models to help product designers in making decisions for the new Balinese product design. Kansei Engineering (KE) was selected to synthesis these factors in order to develop Balinese aromatherapy product design in this study. Kansei Words are keywords that indicate a customer's perception, sensation, or picture of a Balinese aromatherapy product in this study. Furthermore, depending on the customer's personality type, recommendations for design element combination and arrangement were made. In this research, three interviewing specialists resulting in a total of twelve Kansei words, which were used to describe a Balinese aromatherapy product. The words were then rated on a Likert scale (7 scale) by 30 customers of the product. The Principal Components Analysis (PCA) approach was used to examine the assessment results. The study used Balinese aromatherapy massage oil to show how Kansei Engineering and FQTT1 analysis were used to aid product designers in creating new product design decisions for each personality type. The extraction of KW obtained using the PCA approach reduced 12 Kansei words to one word, which reflected a new design concept. In summary, the findings revealed that all design specifications for Balinese aromatic products were unique to each personality, with the majority of them proving to be effective as new design standards. A larger degree of worldwide demand may be envisaged if the product development of Bal Indonesian aromatherapy is more closely linked to consumer personality type (Djatna et al., 2015).

Kansei Robotics: Bridging Human Beings and Electronic Gadgets Through Kansei Engineering written by Kato, Toshikazu. Such an information environment would provide modest and human friendly manner for users including elderly people. Data assistance services, such as suggestion services, are mostly based on social suggestion, which is based on collaborative filtering of a large number of consumers buying records, which does not account for variances in personal preference. Through subconscious contact with a centralized data environment, this work proposes the notion of Kansei mechanism and its modelling approach through unconscious interaction with electronic gadgets. We can model these relationships by statistical behaviour log analysis. Our basic ideas are one is to find users interested and /or preferred items through observation on his behaviours in present everywhere information environment. Secondly, to automatically build his preference model. Lastly, to apply the model to provide suitable information service in the real world. As mentioned above this paper used Kansei modelling to running the experiment. There have three step which is one, Estimation dominant attributes by adopted conjoint analysis as to find the dominant attributes. All those products were analysed with statistically quantification method. Second, method of recommendation considering dominant attributes. When a consumer stands in front of a digital signage unit, the Smart Shop makes product recommendations based on their preferences. They are suggested by a high-scoring order. Lastly, method of recommendation considering dominant attribute. An experiment ran to compare our implicit Smart Shop approach to the old explicit questionnaire technique. Four male students served as subjects. With five phases, the participant assessed his preference for the five recommended goods. This suggestion phase was done three times, yielding a total of 15 product assessments. Respondent given the questionnaire and needed to evaluate the product base on two answer which is 'like' or 'dislike'. And at last, these findings showed that Smart Shop has achieved implicit estimate of prominent qualities using our technique. Finally, these findings showed that Smart Shop achieved implicit assessment of dominating qualities in three of four respondents using our technique. These also shown

that, in the event of predicted dominating qualities by Smart Shop and another by survey that did not fit, modelling by questionnaire satisfied a subject better (Kato, 2013).

In 2010 the study conducted by Nishino Tatsuo titled Kansei Engineering Design of Comprehensive Ball Pen Based on Rough Set Analysis, the researcher discovered consumers' wants, developmental concepts, and design qualities using the suggested hierarchical rough set technique. Therefore, we discovered a variety of appealing design options. As a result of applying three separate decision rule evaluation measures, we discovered many appealing design aspects. Three type of decision rule set are S-S-S (supportive design), E-E-E (unique design) and C-C-C (strong design) Researcher discovered consumers' desires as well as developing concepts and design qualities to actualize customers' desires applying the proposed hierarchical rough set approach. Next, there are 24 female students participated in a Kansei assessment experiment in which they assessed 27 various ball pens using 40 Kansei Word and 5-points SD parameters, including consumer desire and 'attractiveness.' The rough set model proposed in this study is used to derive decision rules for Kansei product design throughout this section. A researcher offers a technique for extracting multi-level decision rules. The technique seeks to connect unspoken client desires, development concepts and design features. The following is the technique for extracting decisions. Step 1 detects principal combinations axis of the component. The derived evaluation criteria might be interpreted as a customer's desire for product development. Step 2 looks for Kansei word combinations. The evaluation criteria that were obtained might be viewed as alternative development approaches for meeting client needs. Step 3 is to identifies design combinations. The extracted decision rules may be thought of as design qualities that help developers meet their goals. Lastly, we may get design specifications to better fulfil objective Kansei through three steps. As a result, there have three final concepts for the design attributes which are S-S-S for common decision rule set is advance design, E-E-E represent unique decision rule set is advance and young, and finally C-C-C represent strong decision rule set the design is advance, young and simple (Nishino, 2010).

In year 2013 a journal named Kansei Engineering for e-commerce Sunglasses Selection in Malaysia by Chuan, Ngip Khean, Sivaji, Ashok Shahimin, Mizhanim Mohamad Saad, and Nursyakinah. Based on restricted physical visual design, researcher utilize a methodical application of Kansei engineering to uncover the design aspect that may provide emotional appeal for e-commerce consumers. 30 Kansei word relating to the sunglasses advert descriptions were investigated utilizing multivariate statistical analysis employing the Kansei engineering type I technique with twenty sample products (specimens). The key Kansei Words were identified using Factor Analysis (FA) and Principal Component Analysis (PCA), while Partial Least Square (PLS) analysis was used to find the key design features that correspond to the chosen Kansei words. To perform the evaluating test using the URANUS system to establish a survey website and 75 people (aged 18 to 34) requested to rate Kansei words appeal on a 5-point SD scale for each of our twenty samples. Analysis begins by using Factor Analysis to identify a limited number of elements that will carry a significant amount of weight. The study data were transferred to Principal Component Analysis, and the association between Kansei words and specimens is discovered. PCA's overall contribution is nearly identical to the results of our Factor Analysis. The appropriate Kansei phrases that might express the emotional appeal of our target consumers are selected at this step of Kansei Engineering. The influential design features are determined using Partial Least Square (PLS) Analysis. The Product Classification and data from the Kansei words survey are used to create PLS. A connection is established between the four Kansei words chosen, and the design feature described in the product. The final design element list has two color scheme and the color for the frame are blue, orange or yellow. The feature for frame is either half or thin frame.



2.2.5 Summary of Literature Review

No.	Year	Author	Title	Method	Data analysis	Product
1	2015	Tama,	Development of	Getting customer	Mapping result statistic in	Souvenir – Ceramic
		Ishardita	Customer Oriented	opinions by answering	Kano model by using	drinking mug
		Pambudi	Product Design using	questionnaire without	SPSS 19.0 software	Feature: basic parabolic-
		Azlia, Wifqi 📑	Kansei Engineering and	limitation	Conjoint analysis –	shaped design, artificial
		Hardiningtyas,	Kano Model: Case Study		determined relationship	exploration with 2D and
		dewi 🦰	of Ceramic Souvenir		between Kansei word and	textured glaze decoration, as
		F			design element.	well as colored
						blocks.
2	2011	Huang, Ming	Applying Kansei	Interview 15 person	Using fuzzy composite	The perfect trade show
		Shyan	engineering to industrial	with mechanical	evaluation.	booth is described as
		Tsai, Hung	machinery trade show	experience and 15 with	· · · · · ·	"scientific," "modern,"
		Cheng	booth design	product design		"bright," "clean,"
		Huang, Tzu		experience	· G. V	"practical," and "pleasant,"
		Hua		Answer 3 survey.	**	all of which are fundamental
		U	VIVERSITI TER	KNIKAL MAL	AYSIA MELAK	elements in new case design.
3	2014	Guo, Fu	Emotional design method	Distribute 3	MDS in SPSS 18.0 it also	Getting the highest score for
		Liu, Wei Lin	of product presented in	questionnaire for	include RSQ(squard	mini digital camera
		Liu, Fan Tao	multi-dimensional	choosing camera	correlation	
		Wang, Huan	variables based on Kansei	product.		
		Wang, Tian Bo	Engineering			

Table 2. 4Summary of literature review.

4	2015	Elokla,	Evaluation of Assistive	Kansei sheet method.	Result evaluated from	Walking stick feature:
		Nermin	Mobility Product for the	Interview and read body	interview and result of	Soft handle.
		Hirai,	Japanese Elderly by the	language		Adjusting height.
		Yasuyuki	Kansei Sheets			Light weight material
5	2015	Djatna, Taufik	A System Analysis and	Collect Kansei word	Using Quantification	Tea powder packaging:
		Kurniati,	Design for Packaging	from books, journal and	theory type 1 (QTT1)	Bright, modern, simple, and
		Wenny Dwi	Design of Powder Shaped	internet.		eye catching.
			Fresheners Based on	Distribute questionnaire		
		11	Kansei Engineering			
6	2015	Achmad	Design of Innovative	Received agreement	Using Stuart Maxwell test	Alarm clock feature:
		Shergian, 💾	Alarm Clock Made from	from 25 respondents		Traditional design (which
		Taufiq	Bamboo with Kansei	who agree with		consist of traditional,
		Immawan	Engineering Approach	innovation		creative, unique and natural)
			da			and Elegant design (which
			AIND -			consist of clear, exclusive,
			1			artistic, and interesting)
7	2014	Mamaghani, j	Kansei Engineering	47 respondents answer	Kaiser-Meyer-Olkin	ketchup sauce bottle feature:
		Nasser Koleini	- 11	the question base on	(KMO)	aesthetic, personality,
		Rahimian,	s Perception of the	feeling with actual	measure of sample	operational, unique and
		Elnaz	Ketchup Sauce Bottle	product.	adequacy and Bartlett's	brittle.
		Mortezaei, 🤳	VIVERSIIITE	NIKAL MAL	Test of sphericity has	A
		Seyed-reza			been used	
8	2015	Djatna, Taufik	Balinese Aromatherapy	12 Kansei word are	Principal Component	The development of Bal
		Wrasiati, Luh	Product Development	getting from	Analysis (PCA), Fuzzy	Indonesian aromatherapy is
		Putu	Based on Kansei	interviewing three	Quantification Theory	
			Engineering and	expert of aromatherapy.	Type 1 (FQTT1).	

		Santosa, Ida	Customer Personality	30 customers involve as		more closely linked to
		Bagus Dharma	Туре	respondents by		consumer personality type.
		Yoga		answering		
				questionnaire.		
9	2013	Kato,	Kansei robotics: Bridging	The subject is 4 male	statistically quantification	These findings showed that
		Toshikazu	human beings and	students with 5 phases	method.	Smart Shop achieved
			electronic gadgets	in 1 evaluation by		implicit assessment of
			through kansei	preferred 5 items in 3		dominating qualities. (3/4)
		1	engineering	times repeated		
		K	3	evaluation using		
			-	questionnaire.		
10	2010	Nishino,	Kansei Engineering	Respondent 24 female	Multiple linear regression	Three final concepts for the
		Tatsuo	Design of Comprehensive	students. 27 vary ball	analysis	design attributes:
			Ball Pen Based on Rough	pens. 40 Kansei Word.		
			Set Analysis	It is using 5-points SD		S-S-S - advance design,
			1	parameters in		E-E-E - advance and young,
		5	N. L.I	questionnaire.	1	
			man and	- und	موم سبح ، م	C-C-C - advance, young and
				4 ⁴		simple.
11	2013	Chuan, Ngip	Kansei Engineering for e-	75 respondents (aged	Factor Analysis (FA) and	Two color schemes, The
		Khean	commerce Sunglasses	18- 34). 30 Kansei	Principal Component	color frame: blue, orange or
		Sivaji, Ashok Shahimin,	Selection in Malaysia	word.	Analysis (PCA), while	yellow. Frame: half or thin frame.
		Mizhanim		20 samples of products.	Partial Least Square	frame.
		Mohamad			(PLS) analysis.	
		Saad,				
		Nursyakinah				

11	2022	Nadiah	Design and development	62 respondent 17 Kansei		The development of air
			of air freshener's casing	word.	quantification method.	freshener's casing is more
			by using Kansei	35 samples of products	Using the SPSS 19.0	closely linked to consumer
			Engineering and Kano		programmed, mapping	personality type.
			Model		the result statistic in the	
			A VOI		Kano model.	



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CHAPTER 3

METHODOLOGY

3.1 Introduction

The method in this research work is design to attain the three research objectives. Air freshener has been chosen as a product domain to develop the prototype. In this research paper, three different phase method is followed by the objective. The first phase is study, second phase is analyzing, and the last phase is design. In addition, the research framework and method are representing in Figure 3.1. To ensure the research is accomplish the objective, framework was design in parallel from the initial study about Kansei Engineering, problem statement, objective of the research, methodology, data collection, data analysis, product design, discussion, and conclusion.

The thesis started with the selection of a product domain as the study's topic. Phase 1 is about research study on Kansei Engineering related to product design. This phase is related to the first objective which is to study the Kansei Engineering applied in product design industry. In phase 2, the methodology used is collected data from respondent about how they are felling about the air freshener by looking at it. Furthermore, data analysis is done using Minitab application to find the correlation in creating new design for a product. Moreover, this phase methodology is to achieve the second objective which is to collect data and evaluate result from Kansei Engineering questionnaire. Last phase is phase 3, the procedure is more on designing the new design for the air freshener and get respond from consumer about the last design. At total, the main idea in this methodology is about planning how to complete this thesis by phase. The work project flow shows in Figure 3.1.

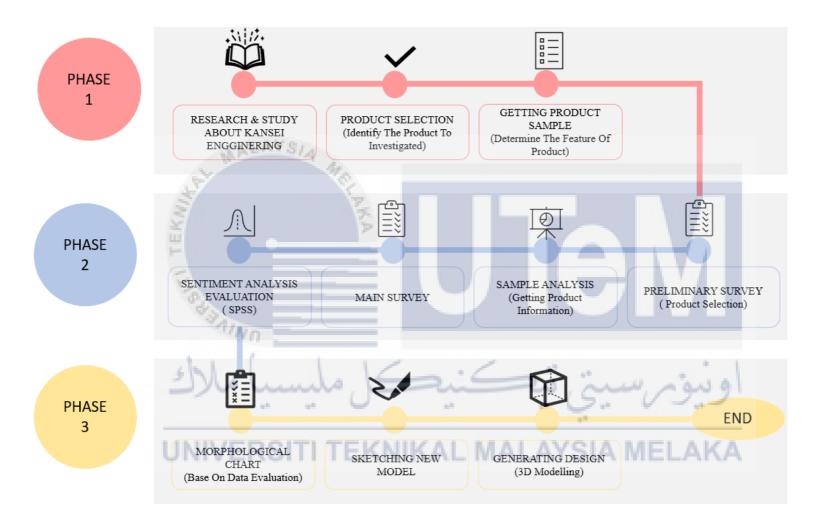


Figure 3.1 Full research framework.

3.2 Phase 1: Understanding Kansei Engineering

In this step is about doing research about Kansei engineering that related to improvising a product design development. The design improvement in Kansei engineering is related with consumer feeling. The first step is identification the main product as the research object. The summary for first phase is presented in Figure 3.2 below.



Figure 3.2 Framework phase 1

3.2.1 Study on Product Design Development

Afterward, the sample for product domain was collected by internet searching and online shopping website. Moreover, the Kansei word were collected from advertisement through electronic device and customer reviews expressing their sentiment about air freshener from internet as well as social media. There have several types of air fresheners available in market Subsequently, the collected samples were sorted by the type of air freshener which is research only take the automatic air freshener. From this point, the element of the product was classified by component. It is easy to respondent to respond in survey.

3.2.2 Product Design Shortlist

Main product is the product that have been chosen to develop the new design concept by using Kansei engineering approach. For this research air freshener have been chosen as main product. 37 air fresheners have been shortlisted by doing further research about air freshener that available in market. The research is done with internet research method and observation. The research method is done by searching the shopping website as well as some review blog. While observation method done at hypermarket in house scent section. All twelve sample of air freshener then will be listed in Kansei first questionnaire to let consumer pick the most attractive.

3.2.3 Collecting Kansei Word

Kansei word is the word that can illustrate the consumers feeling and demand. Kansei word is collected which related to the air fresheners. Usually, Kansei word are adjective or a sentence that related to the feeling about the main product. This Kansei word will used in second survey. Seventeen Kansei word was collected from internet journal and review for online shopping website. In Table 3.1 shows Kansei word for air freshener casing that will be used in this research purpose.

Elegant	Beautiful	Old Fashion	Multicolour	Attractive	Bright
Trendy	Grand	Dual Colour	Stylish	Ordinary	Simple
Eye Catching	Plain	Modern	Easy Handling	Unique	

Table 3.1 Kansei word for air freshener's casing.

3.3 Phase 2: Analyzing Data

In phase 2 to achieve second aim which is data analyzing based on Kansei survey. First thing needs to collect data from user is construct the first questionnaire as known as product selection survey. The questionnaire number one is mostly about getting data of customers choosing the various design of product that available in market and collecting the general information about respondent. It is about twelve design that available in first questionnaire. Figure below is the flow cart for framework in second phase in this research.

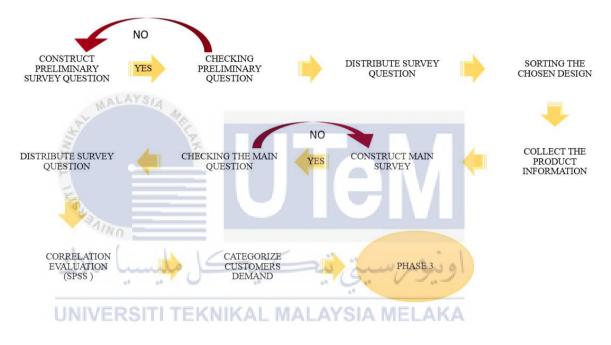


Figure 3. 3 Framework for Data Analyzing Phase.

3.3.1 Kansei survey

Kansei survey is an analytical assessment of consumers' thoughts and opinion on a variety of product samples in the form of a questionnaire that have results from the data set. The main purpose for first questionnaire is to get the data about which design of air freshener that consumer prefer to buy. There only have 2 survey that needed to get the data set for Kansei engineering product development improvement.

3.3.1.1 Preliminary Survey

Meanwhile, the first section in the survey was asking about respondents' general information such as age and gender. Next, for the second section the question was about selection of product that related to domain product which is available in market. There have about 37 type of air freshener design that have been selected. In this section also asking about the shape that more users prefer as well as the color more preferred. The color that has been listed is related to the interior design color that suitable for home decoration. There has some feature that may affect the emotion of users such as the pattern on the casing for spray can, the size for spray hole and the way users prefer to place. Figure below represent example for questionnaire.

3.3.1.2 Data Distribution

The survey was construct using Google Form. By using social media application like Facebook, and WhatsApp as a medium to blast both questionnaires to get attention from uses as respondent. For this study there have no target respondent. This method is applied for all survey in this research paper.

3.3.1.3 Main Survey

The result from the first survey, is a guideline that help to construct second survey question. As for second survey, product that only got highest score for product from first survey is chosen for a further question. In this survey, the question is more focused about the chosen product and more detail feature such as the appearance and feature. Moreover, using the Kansei word let the respondents choose points on each Kansei word of the number of the existing scale with expectation of respondent to the product. Same as in survey number one, firstly construct the question that related to feature that included Kansei word which is the adjective and judgement of the product.

3.3.2 Kano ModeERSITI TEKNIKAL MALAYSIA MELAKA

The Kano Model is a technique for analyzing and measuring consumer demands. It's a method of identifying clients' basic demands, as well as performance and excitement requirements. Therefore, if you include a virtual assistant option, you will increase client happiness and set yourself apart from competition.

In Kano Model product analysis have been classified in to five categories of quality elements by depending on customers satisfaction and customers requirement.

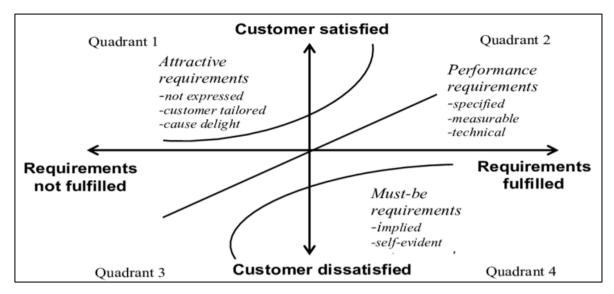


Figure 3.4 Kano Model (Rotar & Kozar, 2017).

1) Attractive quality elements

They bring satisfaction, but when they are not provided, they do not produce frustration because customers do not expect them. An increase in satisfaction leads to an increase in satisfaction, which is not the same as an increase in fulfillment.

2) One-dimensional quality elements

If quality elements are met, they result in happiness; when they are not met, they lead UNIVERSITITEKNIKAL MALAYSIA MELAKA to dissatisfaction. A rising in fulfilment leads to a potential increase in satisfaction, whereas a loss in fulfilment leads to an equal reduction in satisfaction.

3) Must-be quality elements

Whenever quality elements are not met, the user is dissatisfied since they are accepted as fact. However, when they are met, they don't really lead to satisfaction. A decline in fulfilment leads to an increase in discontent that is unequal to the decrease in fulfilment.

4) Indifferent quality elements

Qualities aspects that result in neither satisfaction nor discontent, whether satisfied or unsatisfied

5) Reverse quality elements

Quality characteristics that cause frustration when met and satisfaction when it's not met

Other than that, The SI (positive CS-coefficient) varies from 0 to 1. The closer the value is to one, the higher the impact of achieving the criteria on customer satisfaction; meanwhile, the closer the value is to zero, the less influence. Furthermore, the negative CS-coefficient (DI) varies from 0 to -1. This approach is used to determine the influence of the kano element on functioning, whether it is greater or lower.

3.3.3 Data Analysis (SPSS)

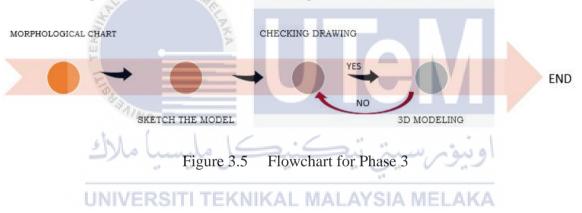
A statistical package for social science is a tool made for quantitative researches have several type of data that can be analyzed by using SPSS software such as nominal data, ordinal data, interval data and ratio data (Garth, 2008). SPSS provides many statistical analysis data such as regression, ANNOVA, quality tools and time series. It can be used to explain the data and make inferences by presenting data using graph. With this way it easy to visualize the data and validate. In main survey, it required to come out with relationships between two variables.

i. Pearson's Correlation

It is very popular statistical analysis compared to other, often used and very useful. Correlation analysis is a standard approach for determining the importance of a bivariate relationship between two variables in this study. Pearson's Correlation analysis is typically performed when the requirements of this test are met (Ong & Puteh, 2017). That quantifies the link between two variables is correlation coefficient, r. As r approaches +1 (Hanushek & Jackson, 2013), an experiment with a high value for one variable is likely to have higher value for the other.

3.4 Phase 3: Product Design Development

In this research report, phase 3 is the final phase. The design and development process will be the main focus of this step, with the target customer defined, applicable product in the market defined, and selection concept for product design according to specifications required. This is the most crucial stage since it determines the project's overall outcome. The flowchart for phase 3 is seen below shows at Figure 3.9.



3.4.1 Pugh Method

Stuart Pugh devised the decision-matrix approach, often known as the Pugh method or Pugh idea selection. It is a qualitative methodology used to rank the multidimensional alternatives in an option set. The Pugh matrix is a mechanism for choosing the most practical approach from all provided possibilities. This is a critical tool used in the product development process to ensure that the proper concept is adopted throughout the concept selection process. There have two step to follow which are select the datum and ranking and assessment (Joshi et al., 2019).

Concept	Relience- Jio	Idea	Vodafone	BSNL	AIRTL
Criteria					
Network	+	+	10 11 11	+	
Datapack	++	+	+	-	-
Talk Time	.++	++	++	+	+
Validity	+++	++	+		+
Costing	++	++	+	656	8 7 0
	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	∑+ signs+∑- signs
	10	8	4	-1	-1

Figure 3. 6 Illustration of Pugh method.

2.3.2 Concept Development: Morphological Chart

The first step in this process is to create a concept using morphological chart analysis. A morphological chart is a table that list all the related product features and discusses various ways as well as variation for achieving them. Through constructing single function from different function, solutions could be displayed in a chart and used as a tool for analyzing alternative solution. That stimulates the development of various combinations of solutions and ideas by using specific mechanisms by each purpose of each principle. The functions can be seen on the left side column of the table in a morphological chart, while different ideas that can be used to carry out the functions mentioned are displayed on the right.

After constructing morphological chart, the combination of idea will be created variation of new concept design to narrow down the scope. A design concept is a product improvement or innovation that improves or innovates the product's appearance, usage, and mechanical physical operation. The development of concept then sketching several drawings to visualize the product.

2.3.3 Sketching Drawing

Sketching drawing is the first step before draw the actual drawing in 3D model. By combining the concept from morphological chart, should have picture for every of it. List all the new development concept drawing. The drawing is only using normal paper. From the morphological chart, 3 concepts of design that can be present in next step.

2.3.4 3D Modelling Drawing

A 3D model is created a design, from the sketch that have been chosen from morphological chart regarding product design product. The selected sketching drawing will proceed with the detail measurement in 3D CAD modelling, and documented detail layout or drawing in Solidworks software.

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CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter covers several subjects. In this chapter, the project's outcomes will be displayed and presented. The outcomes of user preferences regarding product feature and physiognomic parameters have been gathered to identify which product received the most votes from the respondents. There have two data need to be analyzed which is related to new Kansei Engineering product development as well as Kano model method. The purpose of the survey is to gather information about consumer needs based on the functional and dysfunctional aspects of air freshener's casing. The questionnaires were then distributed to the target respondents. All the surveys are using application google form and distributed through social media. The semantic differential (SD) method is used in design development to analyses consumer requirements. To evaluate the psychological worth of product, SD is the most commonly used measuring tool in customer design methods. SD has been used in Kansei Engineering to identify the relationship between emotional responses and products in the design of air freshener casing. The data analysis information needed was analyzed and manipulated using several tools like Statistical Package of Sciences software (SPSS v.25) and Excel to describe the statistical information required correlation between the respondent's emotional word represented by Kansei word versus air freshener function and dysfunction expressed through customer satisfaction of the Kano method.

4.2 Sample Size

The purpose selection survey is to get the number of responses from the user about the 35 different designs of air freshener that are available in the market. The survey contents have three sections which are first is the general information section, second is about the product background, and lastly is about product selection. There are 62 respondents who answered the survey that has been spread at random through social media. They answered the survey by selecting which product's shape, color, and pattern make them feel more attractive to choose.

4.3 Developing Questionnaire

The questionnaire was designed in two surveys which are first to minimize the design as well as the Kansei word that have been collected. The second survey's main objective is to collect data about customer satisfaction regarding the design and the function towards the product attribute which is air freshener casing. Both surveys contain three sections labeled Section A, Section B, and Section C. In the first survey, Section A is about demography question then followed by Section B which product background and lastly Section C is asked regarding the election of Kansei word as well as an election about the existing product design. Meanwhile, for the second survey, the respondents need to answer the survey way more detail which contains three sections as well. Section A same as the first survey which is demography, Section B is about product attributes which the question is more about design selection, then Section C is about the Kano model question which asked about functional and dysfunctional regarding the air freshener.

4.4 **Preliminary Survey**

The preliminary test is essential since constructing the ideal survey questionnaire is difficult. In order to decide the efficient survey questionnaire, it is required to pre-test it before conducting the main survey. The purpose of this survey is to eliminate the unrequired information to minimize the information before proceeding to the main survey. Before distributing the pre-survey, the question has been checked by the expert lecturer to ensure that there does not have no mistake regarding the formatting, language, as well as the other typological error or issues. The survey, which was distributed at random via social media, received 70 responses. Based on Kansei Engineering, the preliminary survey focuses on the consumers' backgrounds in comparison to product design aspects connected to emotional or affective design. The first survey includes the respondent's information, Kansei's words, and three different meanings that based on Oxford, Longman, and Webster Merriam. About 17 Kansei's words were used in the preliminary test. The purpose of this survey is to collect information on which Kansei words were picked by respondents based on their emotions, as well as the expression of their choice for the air freshener case design

4.4.1 Demography Evaluation

For the first section question, respondents were asked about their personal information such as gender, age, and the status of residence. The figures below depict the data obtained for the general information section.

According to Table 4.1, there were 34 men and 36 women among the responders. Figure 4.1 illustrated the pie conversation based on the gender data collected from the respondents. There are 49 percent male respondents and 51 percent female responders among the 70 participants who responded to this survey.

Table 4.1Number of respondents by gender

Gender	Frequency
Female	36
Male	34
Total	70

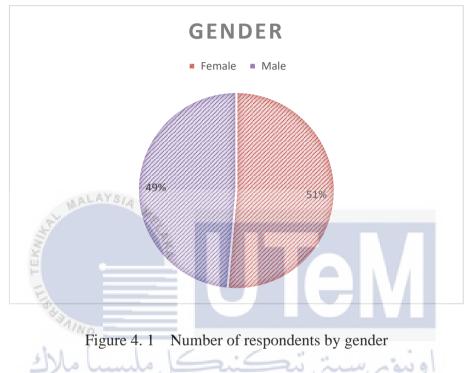


Table 4.2 illustrates the age range of those who answered to the survey. There are four age groups to choose from: 18-30, 31-40, 41-50, and 51 and above. The bar chart in figure 4.2 clearly indicates that the age range of 18 - 30 years old has the highest number of participants, with 37 respondents. Meanwhile, the age groups 31-40, 41-50, and 51 and above had the same number of responders, which is 11.

Frequency
37
11

41-50

Total

51 AND ABOVE

Table 4. 2Number of respondents by age

11

11

70

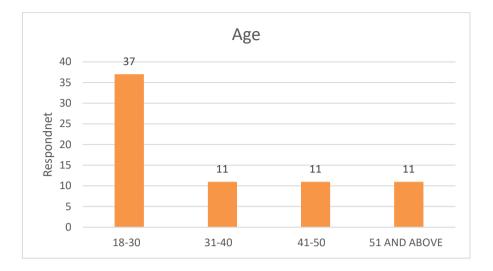


Figure 4.2 Number of respondents by age

The next part of questionnaire is about respondents' residential status, which is divided into three categories: live alone, live with family, and live with roommate. The number of participants based on their resident status is shown in table 4.3 and graphic 4.3. According to the pie chart, the majority of respondents (59 percent or 41 people) live with their families. Meanwhile, the proportions of respondents who live alone and those who live with a roommate are not significantly different, at 14 (20%) and 15 (21%), respectively.

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Table 4. 3	Number of	f respondents	by resid	ence status
------------	-----------	---------------	----------	-------------

Residence	Frequency
Live alone	14
Live with family	41
Live with roommate	15
Total	70

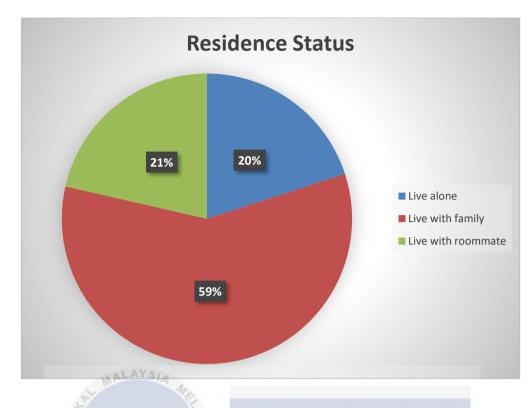


Figure 4. 3 Number of respondents by residence status

4.4.2 Product Background Evaluation

The questions in the second part are related product attributes based on the respondents' opinions. The purpose of this part is to gather opinions and preferences while determining whether or not to purchase an air freshener.

The presence of air freshener in the respondent's home is shown in table 4.4 and a pie chart in figure 4.4. There are three response groups: 0-1, 2-3, and 3 and above. About 44% or 31 out of 70 respondents does not have or having only 1 air freshener in their residence. Nevertheless, about 22 (32%) participants having two to three air fresheners in their home. Finally, there are also respondents who are having 3 and above air fresheners in their home.

Amount of air freshener	Frequency
0-1	31
2-3	22
3 and above	17
Total	70

Table 4. 4Number of respondents according to the number of air fresheners available in
the house.

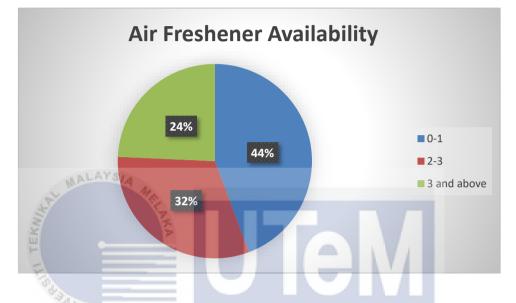


Figure 4. 4 Number of respondents according to the number of air fresheners available in the house

The bar graph demonstrated in figure 4.5 as well as table 4.5 represents the **UNVERSITIEXNIXAL MALAYSIA MELAKA** respondent's choice when purchasing an air freshener. Respondents were to rank the preference feature on an air freshener using a six-point scale for these questions. Color, aroma, pricing, design, and design are the five things to consider when purchasing air fresheners. As shown in the bar graph all features is important base on the voting on scale 6. Besides, the higest number of respondents voting with number 66 person for the branding. Then, respondents may buy the air freshener based on the color which is has been voted by 65 respondents Aside from that, the next feature that respondents prefer to buy air freshener is the scent. There are 60 persons voted. The least preference when buying the air freshener is the price, only 49 persons are voting for that.

Preference	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5	Scale 6
Colour	0	0	2	2	1	65
Scent	2	0	1	2	7	60
Price	0	0	7	7	5	49
Design	0	0	2	4	7	57
Brand	0	0	1	1	2	66

 Table 4.5
 Number of respondents according to buyer preference.



Figure 4.5 Number of respondents according to buyer preference.

Furthermore, one of the reasons a person buys an air freshener is because it is in great shape. As a result, table 4.6 and graph 4.6 demonstrate the features that may convince a consumer to purchase the air freshener. Respondents were asked to select five out of seven features that would persuade them to buy it. The seven options are as follows: attractive shape, affordable price, trendy, uniqueness, reusable, attractive color, and easy handling. According to the table 4.6, the attribute that most influences respondents' purchase decisions is appealing shape, with over 90 percent of all respondents voting for it. Next, is the most attractive features that attract customers is easy handling product design, there have 57 persons tat select these features. After that is the least features that respondents vote is re-useable product. These characteristics are supported by 42 of the 70 respondents. Other characteristics such as trendy, uniqueness, affordable price and attractive color were chosen by 50, 49, 46, and 43 persons of those surveyed.

Feature	Frequency	Ranking
Attractive Shape	63	1
Affordable Price	46	5
Trendy	50	3
Uniqueness	49	4
Reusable	42	7
Attractive Colour	43	6
Easy Handling	57	2

 Table 4.6
 Number of respondents according to product features

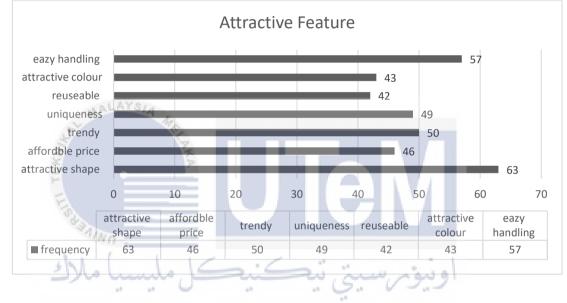


Figure 4. 6 Number of respondents according to product features

4.4.3 Kansei's Word Evaluation

Figure 4.7 displays 17 Kansei's words that are appropriate for the product design of an air freshener's casing. It also displays three definitions for each word from three dictionaries: Oxford, Longman, and Webster Merriam. In this part, respondents must choose five Kansei words that represent their feeling or judgement while choosing a product design.

1		1A	Attractive and exciting in an interesting way			
	1.	1B	Feel rich and glamor			
	Elegant	10	Make you feel confident and delighted			
	1	2A	Popular or fashion at a particular time			
	2.	2B	Latest trend			
	Trendy	20	Not really elegance			
-	3.	3A	Creative, imaginative, inventive or original			
	Eve	38	Aesthetically pleasing			
		30				
	catching	30	Relating to or characteristics of arts or artist			
	4.	4A	Possessing qualities that give great pleasure to see, hear, think about, etc.			
	Beautiful	4B	Wonderful; very pleasing and satisfying			
		4C	Physical appearance is considered extremely attractive			
	-	5A	Magnificent and imposing in appearance, size, or style.			
	5.	5B	Referring to the largest or most significant item of a type			
	Grand	5C	Outstanding, extremely pleasant, or interesting			
	G. 1	6A	Zero expression			
	6.	68	No decoration			
	Plain	6C	No regular or fixed			
Ì	7.	7A	Judged over a period to be the highest quality and outstanding of its kind			
	7. Old fashion	7B				
	Old fashion		Typical, classic, antique, and vintage,			
		7C	A work of art of recognized and established value			
	8. Dual colour	8A	Having more than one colour			
		8B	Good combination of colour			
		8C	Making surrounding look colourful			
		9A	Defined by or employing cutting-edge method, concept, or equipment			
	9.	9B	Changeable from old to new development timing			
	Modern	90	Denoting a current or recent style or trend in art that marked by a			
1	MALMON	1	significant departure from traditional styles and values			
N	10.	10A	the condition of having or showing a variety of colours			
2	Multicolour	10B	Creating a colourful environment			
SI		10C	Colour scheme is excellent.			
×	11.	11A	Fashionably and elegant and sophisticated			
ш –	Stylish	11B	Influenced by fashionable people			
		11C	Admired by many people			
5	12.	12A	Simple operation			
6	Easy	12B	Having or experiencing satisfaction and security			
6.	handling	12C	Handy to used			
-	1/1/13.	13A	Pleasing or appealing to the senses			
	Attractive	13B	Catching the intention			
1.1	Attractive	13C	Showing good aesthetic judgement			
110	14.	14A	No special features			
-/	Ordinary	14B	Typically occur and usually seeing			
	Orthinary	14C	Familiar object			
	15.	15A	Unlike anything else			
IMP	Unique	15B	Different appearance from other product			
s conti	Condac	15C	Not easy to get			
	16.	16A	Natural or casual			
	Simple	16B	No attractive appearance			
	Simple	16C	Nothing much decoration appearance			
	17.	17A	The colour used is primary colour			
	Bright	17B	Colour is extremely thick or vividly brilliant			
		17C				

Figure 4. 7 17 Kansei words

Moreover, from the results that have been selected by the respondents, the top five will be used in the main survey. Table 4.7 and figure 4.8 represents the results of the Kansei word selection using a bar graph. According to the graph in figure 4.8 the highest number of respondents shows at the Kansei word beautiful with the value is 38 respondents. Second highest number of respondents with value 33 persons at the Kansei word plain. For the old-

fashioned word Kansei there is not much difference in the number of respondents with the usual Kansei word which is 32 people. Kansei's words elegant and eye-catching have had the same value in due to the number of responders, which is 30.

	Kansei Word	Frequency	
	Elegant	30	
	Trendy	22	
	Eye Catching	30	
	Beautiful	38	
	Grand	26	
	Plain	33	
	Old Fashion	32	
	Dual Colour	26	
MALAYS/4	Modern	23	
	Multicolour	16	
	Stylish	20	
	Easy Handling	18	
	Attractive	12	
1 _{inn}	Ordinary	6	
	Unique	9	
لىسىام	Simple	3 min and	
1 ² 1 ²	Bright	69. 09.9	

 Table 4.7
 Number of respondents according to Kansei words

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

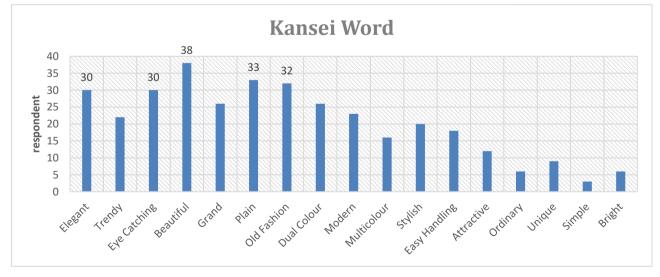


Figure 4.8 Number of respondents according to Kansei words

4.4.4 Product Selection Evaluation

Shape that shows on the object is one of the factors that can influence emotion of customers in making decision. In figure 4.9 shows 35 pieces of air fresheners with five categories that represent different shape and outer features. As the purpose for this part is to reduce the number of product design based on the categories to get only one design to be used in the main survey. Table 4.8 and bar graph in figure 4.10 displays the outcome based on the responses. As a result, design A (25 persons), C (19 persons), D (26 persons), E(28 persons), F (29 persons) and G (23 persons) most of the respondents choose the first design meanwhile design B most respondents choose second design.





Figure 4.9 Air freshener with five categories

Design	А	В	С	D	Е	F	G
1	25	14	19	26	28	29	23
2	14	15	17	8	9	13	12
3	16	13	7	9	10	14	12
4	3	14	9	17	13	6	13
5	12	14	18	10	10	8	10

 Table 4.8
 Number of respondents according to design

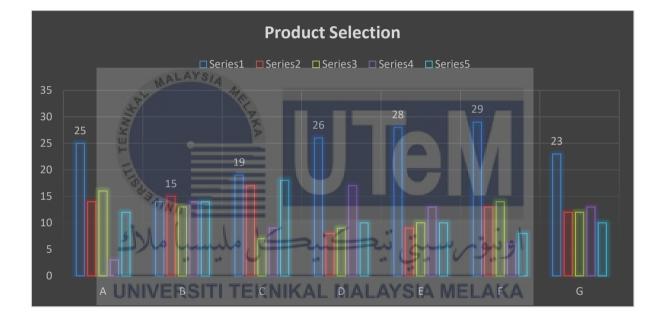


Figure 4.10 Number of respondents according to design

4.5 Main Survey Evaluation

The main survey is the questionnaire that is more focused on finding out the interest in customers regarding choosing the air freshener for their house. This questionnaire, it had been asking more detail about the respondent's feelings using chosen Kansei words in the pre-survey to do the design evaluation. Aside from that, it also had questions regarding functionality and dysfunctionality regarding the air freshener. Same as pre-survey, main survey also has been constructed using Google form and distributed via social media. 62 persons have been responded to this survey. As mentioned before main survey consist of three main section which is demography, product attribute and product design (Kano questionnaire).

4.5.1 Main Survey General Information Evaluation

This demography section divided into two part which is demography information and product background. Gander, age, and occupation status have been asked in demographic section while price preference, first preference toward product asked in the product background.

According to Table 4.9, there were men are majority responds to this survey. Figure 4.11 illustrated the bar chart conversation based on the gender data collected from the survey. There are 38 male respondents and 24 female responders among the 62 participants who responded to this survey

Table 4. 9 Number of respondents according to gender

Il all	Sender Gender		
18	Female	-24	
	Male	38	
UNIVERSIT	Total KNIKAL MAL	A62 SIA MELAKA	

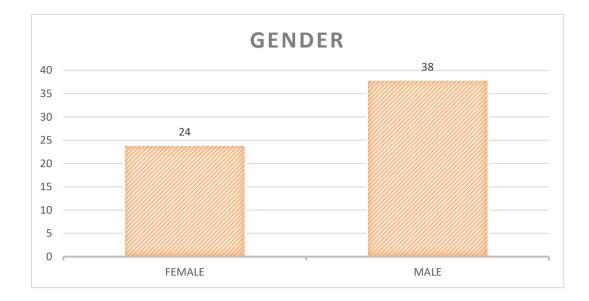


Figure 4. 11 Number of respondents according to gander

Table 4.10 demonstrates the age range of persons who responded to the survey. There are four age categories to pick from: 18-30, 31-40, 41-50, and 51 and above. Figure 4.12 shows pie chart clearly shows that the age range of 18 - 30 years old has the most participants, with 56% from total respondents have replies to this survey. Meanwhile, just 9 people in the age groups 31-40 participated. Respondents between the ages of 41 and 50 have the fewest number of respondents, with only seven people. Finally, 11 people between the ages of 51 and older responded to this survey.

Table 4. 10 Number of respondents according to age

Age	Frequency
18-30	35
31-40	9
41-50	7
51 and over	11
Total	62

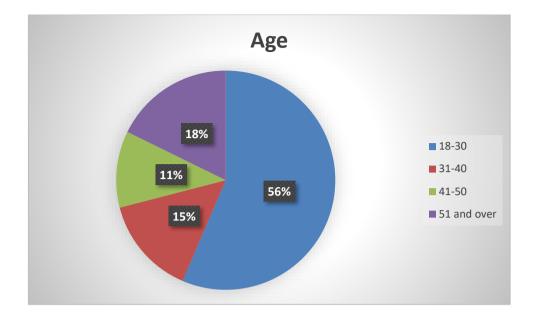


Figure 4. 12 Number of respondents according to age

The final question in demographic section is about responder's occupation status which there have six groups: student, unemployed, under employed, self-employment, profession, and retired. Table 4.11 indicates the number of frequencies. The majority of the respondents to this survey are students, with a total of 33 respondents. It is clearly shown in the figure 4.13. The second highest group of occupation is retired with the value 11 persons. It can relate to the previous question regarding the age of respondent where the age of 51 and above also have the same amount of respondent. Next, the group that has the least number of respondents the respondents the responded to this survey is self-employment, there only 4 persons.

Occupation	Frequency
Student	33
Unemployed	6
Under Employment	6
Self-employment	4
Profession	2
Retired	11
Total	62

 Table 4. 11
 Number of respondents according to occupation

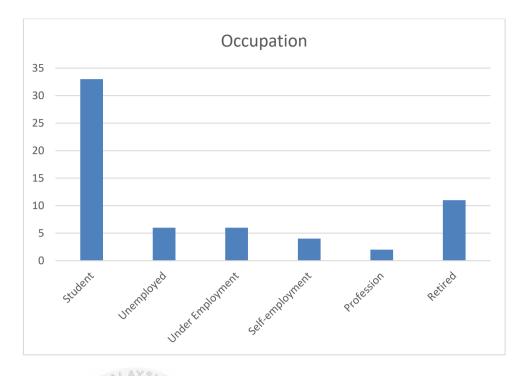


Figure 4. 13 Number of respondents according to occupation

After that, for the second section is about the product background. Where the first question is about the price preferences. Four price preference have been stated in the question: below RM 20, RM 20- RM 30, RM 31- RM 40, and RM 41 and above. As shown in table 4.12 the highest frequency is 56 persons who are vote for price preference below RM 20. Only 6 persons that choose the product price range between RM 20 to RM 30 as their price preference.

 Table 4. 12
 Number of respondents according to price preference

Price Preference	Frequency
below RM 20	56
RM 20- RM 30	6
RM 31- RM 40	0
RM 41 and above.	0
Total	62



Figure 4. 14 Number of respondents according to price preference



4.6 **Product Design Analysis**

In this study, correlation has been used as a statistical method to find out the strength of relationships in two variables. there are two sets of variables that are needed to find the relation which is the relationship between kano and Kansei next is the relationship between Kansei and Kansei. As both relationships will be used in product design development to produce new designs. Other than that, the correlation calculated by using SPSS software. By using SPSS software, the qualitative data have been converted to qualitative data. As well as the schematic data also converted to qualitative data to make it easy to be analyze.

4.6.1 Data Analysis for Relation Kansei and Kansei

ARLAYSIA

The purpose of this data analysis was to define the designs but to also extract the emotions, sentiments, and ideas expressed by respondents in the primary survey in response to each design. Every design has their own attractive features that make it different from other design. In aspects of correlation, the most significant value (1 percent level of significance) and the strongest link were included in the study.

I.Design ANIVERSITI TEKNIKAL MALAYSIA MELAKA

By referring to the table 4.13 shows the correlation between two Kansei's word in design A. Based on the data above there have five data correlation at 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design A. However, the correlation coefficient Pearson's r value shows in the table data above appeared only moderated positive and weak positive for significant correlation coefficient. There is moderate positive correlation between overall customer's view and Kansei's word 'beautiful' which is 0.405. From the r value, it shows that Design A have emotional preference which is beautiful. This feature can be derived from Design A that found on the air freshener's casing. Especially on the spray part which has a different pattern

compared to other air freshener's casing designs. Figure 4.15 shows the labeled features that represent Kansei word beautiful.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.338**	0.320*	0.325**	0.264*	0.405 ^{**} Moderate positive
Plain	0.338**	1	0.178	-0.037	0.186	0.342**
_Classic	0.320^{*}	0.178	1	0.122	0.038	0.393**
Eye-catching	0.325**	-0.037	0.122	1	0.013	0.176
Elegant	0.264^{*}	0.186	0.038	0.013	1	0.223
Overall	0.405^{**}	0.342**	0.393**	0.176	0.223	1

 Table 4. 13
 Number of correlations between two Kansei word for Design A



Figure 4.15 Design A

II.Design B

From table 4.14, by referring the significant level which mark as star, all the data shows important relationship between both Kansei's word for Design B. The highest value of correlation coefficient in the table is 0.576 which is moderate positive correlation coefficient. It is shows that there has positive linear coefficient between the emotional preference 'classic' and the overall customer's overview about the product. From the correlation value, there have classic element in Design B features. By observing Design B features, the outer shape of air freshener's casing looks like classic and old-style shape. Figure 4.16 shows the labeled features that represent Kansei word classic.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	-1	0.384**	0.317^{*}	0.255*	0.322*	0.388**
Plain	0.384**	1	.424**	0.334**	0.467**	0 5 4 8 **
Classic	0.317*	0.424**	1	0.280*	0.186	0.576 ^{**} Moderate positive
Eye- catching	0.255*	0.334**	0.280*	ەم بىلىت :	0.434**	0.455**
Elegant	0.322^{*}	0.467**	0.186	0.434**	- 1	0.414**
Overall	0.388**	0.548**	0.576**	0.455**	0.414**	1

 Table 4. 14
 Number of correlations between two Kansei word for Design B

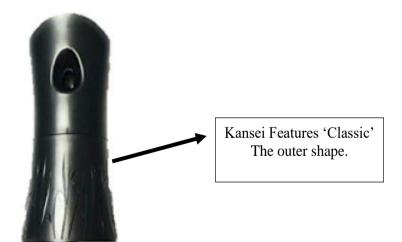


Figure 4. 16 Design B 75

III. Design C

From table 4.15 it shows the correlation between two Kansei's word from Design C. Based on the data above the highest correlation coefficient value is 0.506 and it is 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design C. There is moderate positive correlation between 'elegant' features and 'beautiful' features. From the r value, it shows that Design C have emotional preference which is beautiful and elegant. This feature can be derived from Design C that found on the air freshener's casing. Especially on the spray hole part and the pattern that same shape as the hole which has a different pattern compared to other air freshener's designs. Figure 4.17 shows the labeled features that represent Kansei word elegant and beautiful.

Kansei word	Beautiful	Plain	Classic	Eye- catching	Elegant	Overall
Beautiful	hunt a	0.153	0.104	0.267*	0.506 ^{**} Moderate positive	0.211
Plain	0.153	1	0.011	-0.034	0.479*	0.152
Classic	0.104	0.011	LMAL	0.138	-0.063	0.347**
Eye-catching	0.267^{*}	-0.034	0.138	1	0.050	0.237
Elegant	0.506^{**}	0.479^{**}	-0.063	0.050	1	-0.090
Overall	0.211	0.152	0.347**	0.237	-0.090	1

Table 4. 15 Number of correlations between two Kansei word for Design C

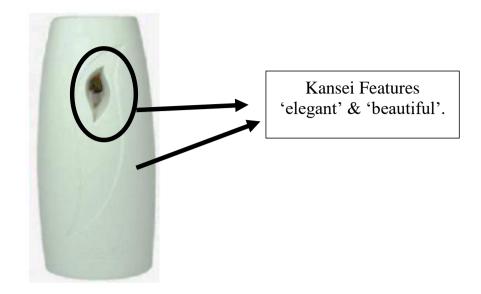


Figure 4. 17 Design C

IV. Design D

Only three data points in table 4.16 indicate a significant correlation relationship at 1% significant level between both Kansei's words for Design D, as shown by the significant level marked with a star. The correlation coefficient with the highest value in the table is 0.511, which is a moderate positive linear correlation coefficient. It proves that there is a positive linear correlation between the emotional preference 'classic' and the overall customer's attitude towards the product. There are classic elements in Design D characteristics based on the correlation value. By observing Design D features, the color, and the pattern on the air freshener's casing it probably looks muddy. Figure 4.18 shows the labeled features that represent Kansei word classic.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.203	0.195	0.203	-0.108	0.427^{**}
Plain	0.203	1	0.207	-0.058	0.089	0.273**
Classic	0.195	0.207	1	0.038	0.088	0.511 ^{**} Moderate positive
Eye- catching	0.203	-0.058	0.038	1	0.224	0.243
Elegant	-0.108	0.089	0.088	0.224	1	0.190
Overall	0.427^{**}	0.373**	0.511**	0.243	0.190	1

Table 4.16 Number of correlations between two Kansei word for Design D



Figure 4. 18 Design D

V. Design E

The correlation between two Kansei's words in Design E is seen in table 4.17. Based on the data presented above, correlation at the 1% level of significance is accessible at the weak positive linear correlation coefficient of 0.378, which is also the greatest correlation value when compared to other data. That there is a link between two separate Kansei's words for Design E is indicated. According to the table above, the high degree of correlation exists between two variables which is total respondent overview and Kansei's term 'beautiful.' The r value indicates that Design E has an emotional preference, which is lovely. This feature is taken from Design E, which is located on the air freshener's casing and has additional features that distinguish it from other designs. Especially the top half, which is shaped differently from other air freshener case designs. Figure 4.19 shows the labeled features that represent Kansei word beautiful.

Table 4. 17 Number of correlations between two Kansei word for Design E

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall				
Beautiful	1	0.188	0.166	0.226	0.363**	0.378 ^{**} Weak Positive				
Plain	0.188	1	0.120	0.236	.303*	0.315*				
Classic	0.166	0.120	1	0.233	0.083	0.350**				
Eye-catching	0.226	0.236	0.233	1	0.140	0.347**				
Elegant	0.363**	0.303*	0.083	0.140	1	0.211				
Overall .	0.378**	0.315*	0.350**	0.347**	0.211	1				
LIBE	and the second									
بالح	سيا ملا	فل مليه		سيتي آيد	اونيوم					
UN	UNIVERSITI TEKNIKAL MALAYSTA MELAKA Kansei Features 'Beautiful' The top shape and the pattern									

Figure 4. 19 Design E

VI. Design F

From table 4.18 it shows the correlation between two Kansei's word from Design F. Based on the data above the highest correlation coefficient value is 0.685 and it is 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design F. There is moderate positive correlation between 'elegant' features and 'beautiful' features. From the r value, it shows that Design C have emotional preference which is beautiful and elegant. This feature can be derived from Design F that found on the air freshener's casing. Especially on the spray outer shape which the curve is a different pattern compared to other air freshener's designs. Figure 4.20 shows the labeled features that represent Kansei word elegant and beautiful.

Table 4.18 Number of correlations between two Kansei word for Design F

12		5				
Kansei word	Beautiful	Plain	Classic	Eye-catching	Flogant	Overall
Beautiful	1	0.478**	0.611**	0.399**	0.685 ^{**} Moderate Positive	0.620**
Plain	0.478^{**}	1	0.120	0.415**	0.451	0.426**
Classic 🛓	0.611**	0.120	2.1	0.256*	0.623**	0.539**
Eye-catching	0.399**	0.415**	0.256^{*}		0.461**	0.631**
Elegant		0.451**		0.461**	AKA	0.628**
Overall	0.620^{**}	0.426**	0.539**	0.631**	.628**	1

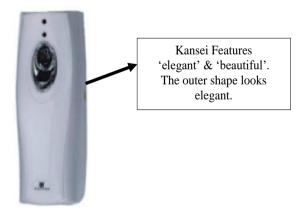


Figure 4. 20 Design F

VII. Design G

Table 4.19 shows a significant correlation link at the 1% level between Kansei's words 'Plain' and the average consumer perspective toward the product for Design G, with the greatest correlation value of 0.471. Person's product correlation has a modest positive linear correlation coefficient. Based on the correlation value, there are plain elements in Design G features. Observing Design G features, the only colour available is black, making Design G plain. The second highest correlation coefficient in the table is 0.451, which has a link between Kansei's words 'Plain' and 'Beautiful.' Because both correlations contain 'plain' Kansei's term as essential elements in Design G, it is possible to deduce that Design G is plain, yet the responder believes it is beautiful. Figure 4.21 shows the labeled features that represent Kansei word plain and beautiful

Kansei word	Beautiful	Plain	Classic	Eye- catching	Elegant	Overall
Beautiful	n In I	0.451 ^{**} Moderate Positive	0.208	0.415** مىتى ئىھ	0.220 و نبو م	0.401**
Plain U	0.451 ^{**}	TI TEKNI	0.138 KAL M/	0.295*	0.207 MELAK	0.471 ^{**} Moderate Positive
Classic	0.208	0.138	1	0.208	-0.111	0.264^{*}
Eye- catching	0.415**	0.295*	0.208	1	0.144	0.129
Elegant	0.220	0.207	-0.111	0.144	1	0.238
Overall	0.401**	0.471**	0.264^{*}	0.129	0.238	1

Table 4. 19 Number of correlations between two Kansei word for Design G



Figure 4. 21 Design F

VIII. Analysis Summary

As shown in the table 4.20 is the summary for relationship between Kansei's word and Kansei's word for all design that have been selected. Throughout all, each design has its own representative, in Kansei's words, that expresses emotion from responders. According to table 8, the majority design is based on beautiful Kansei's word, while there are two designs that are based on classic.



				Eye		
Kansei word	Beautiful	Plain	Classic	catching	Elegant	Overall
					0.506**	0.405**
Beautiful		0.451**			0.685**	0.378**
					0.085	0.471 **
Plain						
Classic						0.576**
Classic						0.511**
Eye catching						
Elegant						
Overall						

 Table 4. 20
 Summary Number of Correlations Between Two Kansei Word For 7 Design

4.6.2 Data Analysis for Relationship Kansei Word and Kano Model.

The goal of this data analysis was to establish the functionality of the product design. Every design has a function that makes it useful. In terms of correlation, the study contained the most significant value, 0.001 level of significance, and 0.005 level of significance, as well as the strongest relationship.

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a. Design A

Table 4.21 demonstrates the relationship between Kano's model and Kansei's word about Design A. Table 4.21 shows three significant correlations, one at the 1% significant level and two at the 5% significant level. The maximum negative correlation value presented in table 4.21 is -0.371, indicating that the strength of the correlation is moderately significant but in negative value. That also is, the relationship between Kansei's term "Classic" and Kano's word "Wall Hanging" is moving in the opposite way or has an inverse correlation. In other words, when the Kano's word 'Wall Hanging' increases, the Kansei's word 'Classic' decreases. When Design A was not hung on the wall, it seemed more classic. Other than that, timer setting versus plain design is the highest positive value correlation that shown in the table 4.21 which is 0.318. The relationship between Kansei's word 'Plain' and Kano's word 'Timer setting' is moderate positive correlation. Next, the relationship strength between Kansei's word 'Classic' and Kano's word 'To replace the fill can' is 0.253 which is weak positive correlation. Each positive value is significant correlation at 5 % significant level. Since this correlation between Kansei's word and Kano's word is significant, it indicates that the connection has a better relationship. At total for Design A, the functionality can be described from the Kano's model section which is timer setting, to replace the refill can and wall hanging function.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.186	0 .318* Moderate Positive	0.163	0.204	-0.110	0.122
Charger Battery	0.022	0.046	0.101	0.036	0.003	-0.048
To Replace the Refill Can	0.219	0.208	0.253* Weak Positive	0.129	0.01	0.178
Timer Options	-0.244	0.032	0.006	-0.143	-0.121	-0.019
Wall Hanging	-0.194	0.047	-0.371** Moderat e Negative	0.086	-0.049	-0.026
Self-Spray Button	0.067	-0.044	0.238	0.083	0.102	0.045
Rectangul ar Shape	-0.031	0	0.118	-0.144	-0.095	0.069
Battery Indicator	0.150		-0.046	0.062	0.244	0.017
Spray Refill Indicator	0.248	SIT <u>0.062</u> KN	0.064 M	AL0.068IA	M6.155 K	0.175
Decoratio n Purpose	-0.016	-0.152	-0.005	0.028	0.082	-0.003
Vase Shape	-0.092	0.046	0.007	0.079	0.054	-0.043

 Table 4. 21
 Number of correlations between Kansei word and Kano model for Design A

b. Design B

By referring table 4.22 it shows the relationship of Kansei's word versus Kano's model regarding Design B. In the table there have four correlation that are significant at 0.05 level. The relationship between Kansei' word 'Plain' and Kano's word 'Vase Shape' shows the highest value in negative correlation which is -0.310. Since the correlation strength is moderate negative, which is the highest strength in the table, the variable can be extract as important feature for new design. from the inverse correlation which means Kansei's word 'Plain' increases while Kano's word 'vase shape' decreases. In other words, the casing of the basic design air freshener does not look a vase. Following that, there are two correlation values that are based on the same Kano's model word, which is charger battery. Both values are weak positive correlation value, but it is the highest strength correlation compared to other value. First is the relationship between Kansei's word 'Plain' and Kano's word 'Charger Battery' with the value 0.287. Second highest strength correlation on the table is relationship between Kansei's word 'Classic' against Kano's word 'Charger Battery' with the value is 0.268. Since both correlations are positive, an air freshener with a rechargeable battery is preferred, whether the style is basic or traditional. Finally, a significant correlation exists between Kansei's word 'Beautiful' versus Kano's word 'Rectangular Shape', although its strength is small, and it is represented by the number 0.260. It is claimed that such beautiful design is featured in rectangle form



Figure 4. 23 Design B 86

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	-0.011	-0.052	-0.096	0.134	0.158	0.142
Charger Battery	0.205	0.287 [*] Weak Positive	0.268 [*] Weak Positive	0.002	0.227	0.177
To Replace the Refill Can	-0.046	-0.144	0.093	0.106	-0.095	-0.166
Timer Options	-0.077	0.227	-0.046	0.122	0.055	0.148
Wall Hanging	-0.208	0.014	-0.164	-0.09	-0.161	-0.089
Self-Spray Button	0.206	-0.021	0.076	-0.071	0.079	-0.029
Rectangul ar Shape	0.260* Weak Positive	0.020	0.133	0.009	0.139	0.058
Battery Indicator	-0.190	0.187	-0.026	0.076	0.085	-0.079
Spray Refill Indicator	0.057	0.083	0.190	0.042	0.121	0.096
Decoratio n Purpose	-0.115 JNIVERS	0.118 ITI TEKNI	-0.006 KAL MAI	0.126 AYSIA ME	-0.096 LAKA	0.003
Vase Shape	-0.025	-0.310 [*] Moderate Negative	-0.233	-0.148	-0.155	-0.200

Table 4. 22 Number of correlations between Kansei word and Kano model for Design B

c. Design C

Table 4.23 presents the relationship between Kansei's term and Kano's model regarding Design C for air freshener's casing. There are just two significant correlations attributed with this design where the level of significant is 5%. First, the relationship between overall review from respondent about Design C and Kano's word 'Wall Hanging' shows a negative weak correlation with the value -0.269. That's mean the relationship is

invers correlation where most of the respondent does not like the air freshener hanging on the wall. Moreover, the greatest positive correlation value in the relationship is 0.262, which is carried by Kansei's word 'Eye Catching' and Kano's word 'Self Spray Button.'. It is stated that these two variables are independent of one another because the air freshener has a self-spray button, which is one of the features that the respondent desired.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.026	-0.014	-0.172	0.012	0.056	0.147
Charger Battery	0	-0.074	-0.001	0.042	0.008	-0.007
To Replace the Refill Can	-0.043	0.233	0.040	-0.102	0.071	-0.058
Timer Options	-0.080	-0.031	-0.078	0.005	-0.236	0.005
Wall Hanging	-0.058	0.025	-0.225	0.062	0.035	-0.269* Weak Negative
Self-Spray Button	-0.092	-0.034	0.067	0.262* Weak Positive	-0.127	0.107
Rectangula r Shape	0.086	0.115	-0.076	0.078	0.170	- 0.100
Battery Indicator	0.034	0.075	0.020	0.031	-0.194	0.221
Spray Refill Indicator	-0.017	-0.179	0.133	0.058	-0.131	-0.009
Decoration Purpose	سیا ملاك -0.054	کل ملب -0.077 TI TEKNIK	-0.099	ر سینی (0.118 VSIA ME	و بيو -0.106	-0.157
Vase Shape	-0.057	-0.008	-0.065	0.152	-0.134	0.186

 Table 4. 23
 Number of correlations between Kansei word and Kano model for Design C

d. Design D

Table 4.24 shows that there is just one significant correlation. The correlation that has highest value in the table 4.24 is state in relationship between overall overview from respondent and Kano's word 'Wall Hanging' with the value is -0.285. The value of correlation coefficient indicates that it is an inverse correlation, implying that the relation is reversible. Since, the relationship is inversely related, with the majority of respondents disliking the air freshener hanging on the wall. Next, from the table there no positive

correlation, so the highest positive correlation in the table has chosen as a preference for the next new design features for air freshener. The correlation between Knasei's word "eye-catching" and Kano's word "rectangular shape" is fairly strong, with a value of 0.216. Respondents believe that an air freshener in a rectangular form is more visually attractive.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.192	-0.013	-0.056	-0.001	-0.053	-0.046
Charger Battery	-0.016	0.110	0.095	0.141	0.144	0.171
To Replace the Refill Can	0.116	0.046	0.082	-0.157	0.115	0.024
Timer Options	0.118	0.096	-0.109	-0.032	-0.100	0.027
Wall Hanging	-0.232	-0.203	-0.117	-0.023	-0.029	-0.285* Weak Negative
Self-Spray Button	0.012	-0.14	0.051	0.145	0.099	0.006
Rectangular Shape	0.079	-0.13	-0.061	0.216 Weak Positive	0.152	-0.151
Battery Indicator	0.026	-0.088	-0.010	-0.088	0.086	0.103
Spray Refill Indicator	0.080	0.108	-0.079	-0.013	-0.050	0.174
Decoration Purpose		0.031	-0.106	0.024	او نیو ۔ -0.208	-0.015
Vase Shape	-0.039	-0.185	0.108	0.082	-0.026	-0.051

Table 4. 24 Number of correlations between Kansei word and Kano model for Design D

e. Design E

Next, table 4.25 show the value of correlation coefficient between Kansei's word and Kano's word. From the table 4.25 the highest value of the correlation coefficient is 0.273 with the level of significant 5%. The relationship is between Kansei's word 'Plain' versus Kano's word 'Wall Hanging'. The correlation coefficient has a low strength. Because the highest value is significant, it may be concluded that Design E lacks an appealing characteristic that will entice responders. According to the relationships that show a substantial association, respondents felt that Design E appeared simple when it was hung on the wall.



Figure 4. 26 Design E

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.134	-0.156	-0.108	-0.028	0.132	-0.054
Charger Battery	-0.181	-0.062	-0.044	0.029	0.019	0.025
To Replace the Refill Can	-0.170	0.035	-0.007	-0.071	-0.175	-0.072
Timer Options	0.089	-0.169	-0.167	-0.032	0.162	-0.183
Wall Hanging	-0.190	0.273* Weak Positive	0.045	0.066	-0.190	0.060
Self-Spray Button	0.018	0.076	-0.025	0.105	0.036	-0.043
Rectangula r Shape	0.014	0.181	0.010	0.045	-0.130	-0.088
Battery Indicator	-0.179	-0.087	-0.077	-0.170	-0.046	-0.209
Spray Refill Indicator	<u>10.045</u>	-0.092	-0.062	0.039	0.006- ويبو	-0.092
Decoration Purpose	JN-0.096 SI	-0.068	(Al0.073\L/	Y 0.058/E	LA 0.036	0.159
Vase Shape	0.002	-0.067	-0.057	-0.196	-0.061	-0.128

Table 4. 25 Number of correlations between Kansei word and Kano model for Design E

f. Design F

Table 4.26 indicates that there are four significant correlation coefficients with a 5% level of significance. The first correlation has the greatest correlation coefficient value of 0.299 but the strength is weak. This relationship is based on the words 'Eye Catching' by Kansei and 'Spray Refill Indicator' by Kano. This shows that responders to Design F believe that an air freshener would be more attractive if the design included a spray refill indicator.

In addition, the second highest correlation coefficient from table 4.26 shows in the relationship between Kansei's word 'Beautiful' versus Kano's word 'timer setting with the strength of correlation also weak positive. As a consequence of the results, it is apparent that Design F has a great feature on timer setting. Besides, the relationship that also have 5% significant level of correlation coefficient is between Kansei's word 'Elegant' and Kano's word 'Wall Hanging' with the value of correlation coefficient -0.260. Since the coefficient value is negative, the link between the two variables is inverse, which implies the air fresheners may seem more beautiful if they are not hung on the wall. Lastly, the relationship between Kansei's word 'Classic' and Kano's word 'Charger Battery' which have the correlation coefficient value 0.253. It's really conceivable that Design F would seem more classical if it came with a charging battery.



Figure 4. 27 Design F

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.261* Weak Positive	0.107	0.198	0.094	0.083	0.069
Charger Battery	0.141	-0.086	0.253* Weak Positive	0.062	0.119	0.201
To Replace the Refill Can	0.197	-0.067	0.042	-0.154	0.119	-0.122
Timer Options	-0.160	0.060	-0.242	-0.055	-0.201	-0.104
Wall Hanging	-0.183	-0.005	-0.151	-0.056	-0.260* Weak Negative	-0.101
Self-Spray Button	0.070	-0.056	0	0.021	0.021	0.163
Rectangular Shape	0.054	0.201	-0.042	0.009	0.018	0.034
Battery Indicator	0.019	-0.166	0.227	0.022	0.178	0.096
Spray Refill Indicator	0.127	-0.090	0.175	0.299* Weak Positive	0.160	0.225
Decoration Purpose	-0.223	-0.099	(<u>40.015</u> A	LA-0.070 N	IE-0.165 A	-0.182
Vase Shape	-0.114	-0.048	-0.139	0.018	-0.043	-0.121

Table 4. 26 Number of correlations between Kansei word and Kano model for Design F

g. Design G

Table 4.27 demonstrates the relationship between Kano's model and Kansei's word about Design G and five correlation coefficient that have same level of significant coefficient which is 5%. The highest value of correlation coefficient that have in the table 4.27 is -0.295 which is from the relationship between Kansei's word 'Eye Catching' between Kano's word 'Vase Shape'. Since the correlation value is negative, it implies that the correlation is inverse, thus the conclusion is that the design, which has a vase form, is indeed not particularly desirable. Moreover, there are two correlation values that are based on the same Kansei's word, which is classic. Both values are weak negative correlation value. The first relationship is between Kansei's word 'Classic' and Kano's word 'Self Spray Button,' that has a larger value than the other, since it has a value of -0.292. Second, is the relationship between Kansei's word 'Classic' and Kano's word 'wall hanging', with the correlation value -0.278. As a consequence of the results for both relationships, it is possible to interpret that Design G seemed less classic if the air freshener was hung from all or had a self-spray button. In the same way, there have al so two correlation that is significant in the same column on the Kansei's word which is elegant. First is the relationship between Kansei's word 'Elegant' and Kano's word 'Rectangular Shape' with the value 0.275. Since the strength of the correlation is positive weak relationship so, the correlation is directly proportional. That would be to say, Design G appeared elegant in the rectangular shape. Lastly, the relationship between Kansei's word 'Elegant' and Kano's word 'Battery Indicator' with value of correlation coefficient is -0.269. As a result, design G seemed elegant without the battery indicator UNIVERSITI TEKNIKAL MALAYSIA MELAKA

C

Figure 4. 28 Design G 96

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.139	0.046	0.030	-0.050	0.046	-0.055
Charger Battery	-0.090	0.118	-0.195	0.064	0.099	-0.248
To Replace the Refill Can	0.095	0.007	-0.040	0.117	0.031	-0.111
Timer Options	-0.087	-0.039	-0.049	-0.155	-0.141	0.035
Wall Hanging	-0.135	0.067	-0.278 [*] Weak Negative	0.111	-0.076	-0.065
Self-Spray Button	-0.002	0.002	-0.292* Weak Negative	0.064	0.219	-0.160
Rectangula r Shape	0.082	-0.020	-0.155	0.081	0.275* Weak Positive	-0.122
Battery Indicator	-0.017	-0.048	0.107	0.031	-0.269* Weak Negative	-0.103
Spray Refill Indicator	0.137	0.035	0.032	0.172	- 0.145	-0.107
Decoration Purpose	INI-0.002SIT	ц т- 0.077 і К	A0.023_A	(SI0.137EL	AK-0.159	-0.140
Vase Shape	-0.135	-0.101	-0.112	-0.295* Weak Negative	0.098	0.158

Table 4. 27 Number of correlations between Kansei word and Kano model for Design G

h. Analysis Summary

Table 4.28 shows the summary for relationship between Kansei's word and Kano's word for all design that have been selected. The purpose for this summary is to shortlist the relationship between design and the functionality for the air freshener. According to the chart, the wall hanging Kano's word has 5 designs on it. As a result, it is possible to conclude that wall hanging is the most important functionality that can be extracted from this table

Design	A	B	C	D	E	F	G
Indicator							

Table 4. 28Summary Number of Correlations Between Kansei Word and Kano Model
For 7 Design

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.261 *	0.318*				
Charger Battery	AVer	0.287*	0.268* 0.253*			
To Replace the Refill Can	ALL AL		0.253*			
Timer Options	2					
Wall Hanging		0.273*	-0.371** -0.278*	ΞW	-0.260*	-0.269* -0.285*
Self-Spray Button	n .		-0.292*	0.262*		
Rectangular Shape	0.260*	فنيك	1 in	ىبو 0.216 يى	0.275 *	
Battery Indicator					-0.269*	
Spray Refill Indicator	KSIII IEI	(NIKAL I	MALAYS	0.299*	A	
Decoration Purpose						
Vase Shape		-0.310*		-0.295*		

4.6.3 Kano Model Evaluation.

The Kano model is used to determine customer satisfaction based on consumer requirements for a product characteristic, which is functionality. Standard Kano models are used code like M>O>A>I (Must-be, one dimensional, Attractive and indifferent) to determine Kano model attributes based on client requirements and decision making. The Kano analysis is used to classify respondents' expectations based on the combination of consumer reactions to both functional and dysfunctional questions.

Table 4.28 displays the results for the Kano question, which was answered by 62 people. As the purpose for Kano model question is to evaluate features on function based on the probability to satisfy the user or consumers. The result from Kano question shows majority leads at the indifferent category which is nine functions lies on this category. There are two function that have highest number on Questionable category which is timer setting and battery charger with value 43 and 21 respectively. Generally, Must-be category is most important in product develop design. For charger battery functioning, there are three highest values with minor differences that range into the categories of questionable, indifferent, and must-be so, the charger battery could be changed to must-be. The minor difference value is 4. The evaluation data for indifferent category is replace the refill can (41), timer option (53), wall hanging (40) , Self-spray button (38), rectangular shape (35), battery indicator (23), spray refill indicator (34), decoration purpose (39) and vase shape (38).

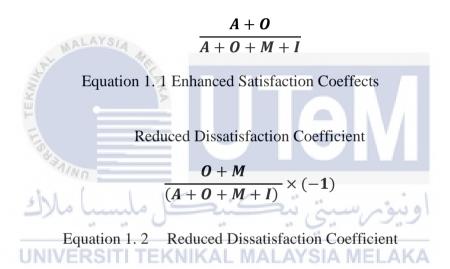
Product Requirement	Α	0	Μ	Ι	R	Q	Total	Category
Timer Setting	0	0	12	3	4	43	62	Q
Charger Battery	0	0	17	18	6	21	62	Q
Replace the Refill Can	0	0	5	41	12	4	62	Ι
Timer Options	0	0	4	53	3	2	62	Ι
Wall Hanging	0	0	8	40	13	1	62	Ι
Self-Spray Button	0	0	11	38	11	2	62	Ι
Rectangular Shape	0	0	16	35	8	3	62	Ι
Battery Indicator	0	0	23	23	12	4	62	М
Spray Refill Indicator	0	0	17	34	6	5	62	Ι
Decoration Purpose	0	0	12	39	10	1	62	Ι
Vase Shape	0	0	9	38	13	2	62	Ι
ليسيا ملاك	کل ما	~		عين ر	÷	يوس	اود	

Table 4.28 The Result for Kano Question

4.6.4.1 CS Coefficient, SITI TEKNIKAL MALAYSIA MELAKA

The CS-coefficient of customer disappointment is followed by a minus sign to indicate that if this product quality is not reached, it will have a negative influence on customer satisfaction. The positive CS coefficient ranges from 0 to 1; the closer it is to 1, the higher the effect on customer satisfaction. A positive CS-coefficient close to 0 suggests that the impact is insignificant. At the same time, the negative CS-coefficient must be considered. If it reaches zero, the influence on consumer dissatisfaction is especially strong if the examined product attribute is not satisfied. A value close to 0 implies that failing to achieve this attribute results in no discontent The respondent's satisfaction coefficient measures how many satisfactions increases when a product need is supplied and decreases when a need is not met. It is beneficial to evaluate the average impact of a product or service requirement on overall customer satisfaction. This coefficient is calculated using the following questionnaire. When the two or three most compelling requirements for each consumer group are met, the outcome is an unrivalled mix of product attributes. By adding the must-be and one-dimensional columns and dividing by the same normalization factor, the average impact on dissatisfaction can be calculated.

Enhanced Satisfaction Coeffects



By referring to the table 4.29 it shows that the reduced dissatisfaction coefficient column has highest value which is -0.8 where the product functionality is timer setting. Other than that, the second highest value from the same column is -0.5 which the product requirements is battery indicator. Since the value is nearest to -1 it shows that the feature needs to be included in the product design or else it cm make strong impact on customers dissatisfaction.

Product	A	0	Μ	Ι	Total	Category	$\frac{A+O}{A+O+M+I}$	$\frac{0+\mathbf{M}}{(\mathbf{A}+0+\mathbf{M}+\mathbf{I})}$
requirement							A + O + M + I	(A+O+M+I)
								× (-1)
Timer	0	0	12	3	62	Q	0	-0.8
Setting								
Charger	0	0	17	18	62	Q	0	-0.48
Battery								
To Replace	0	0	5	41	62	Ι	0	-0.11
The Refill								
Can								
Timer	0	0	4 AYSI	53	62	Ι	0	-0.07
Options	2	AAL	1.01	A 140				
Wall	0	0	8	40	62	Ι	0	-0.16
Hanging			•					1
Self Spray	0	0	11	38	62	I	0	-0.22
Button	8.9)	/wn	-					
Rectangular	0	0	16	35	62		0	-0.31
Shape			*	et .	0		ومهييي	291
Battery UI	0	0	23	23	62	AL& M	AYSIA MELA	-0.5
Indicator								
Spray Refill	0	0	17	34	62	Ι	0	-0.33
Indicator								
Decoration	0	0	12	39	62	Ι	0	-0.23
Purpose								
Vase Shape	0	0	9	38	62	Ι	0	-0.19

Table 4. 29 The Result for CS Coefficient

4.7 Morphological Chart.

Table shows morphological chart that have been construct from both summary table that shows relationship Kansei's word and Kano model. The aim of this chart is to capture the required product functionality and to investigate alternate strategies and combinations of delivering that functionality. There may be several different solutions for each element of product function. There have three concept that shows from the same morphological chart. Every concept has their own sketching idea of the product.



Options Function	1	2	3	4
Body shape		*		***** ***
Nozzle shape				
Timer Setting	Adjustable button	Button	eN	
ملاک Power supply IVE	AA Battery	Electric supply	Rechargeable battery	او A
Refill can compartment	Socket	Flip		

Table 4. 30The morphological chart

A. Concept 1

10	Table 4. 31 The morphological chart for concept 1						
Options Function	1	2	3	4			
Body shape		*	C				
Nozzle shape							
Timer Setting	Adjustable button	Rutton					
Power supply	AA Battery	Electric supply	Rechargeable battery	او			
Refill can compartment	Socket	Flip					

Table 4. 31The morphological chart for concept 1

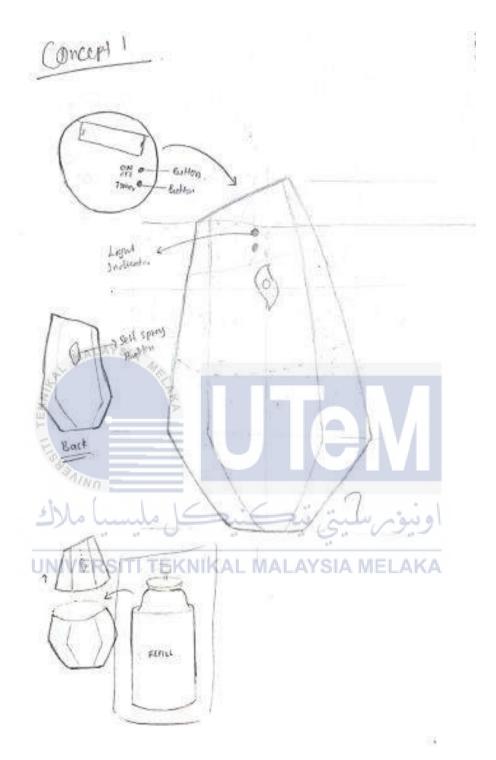


Figure 4. 29 Sketching for concept 1

B. Concept 2

Ta	able 4. 32 The mo	rphological char	t for concept 2	
Options Function	1	2	3	4
Body shape		*		· 11
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	او
Refill can compartment	Socket	Flip		

Table 4. 32The morphological chart for concept 2

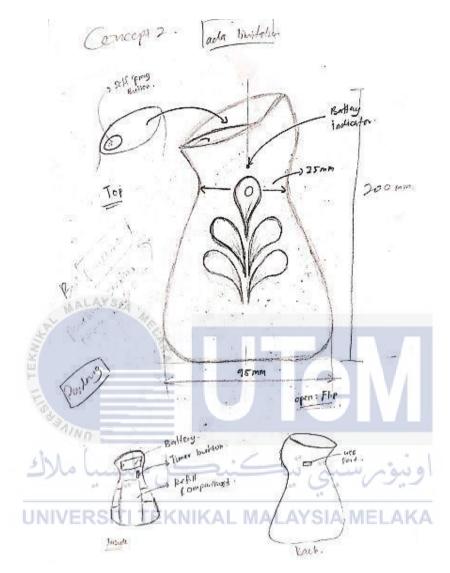


Figure 4. 30 Sketching for concept 2

C. Concept 3

10	able 4. 33 The mo	orphological chai	t for concept 5	
Options Function	1	2	3	4
Body shape		*	0	-01 -01
Nozzle shape				
Timer Setting	Adjustuble button	Button		1
Power supply	AA Battery	Electric supply	Rechargeable battery	او
Refill can compartment	Socket	Flip	OIA HELAP	

Table 4. 33The morphological chart for concept 3

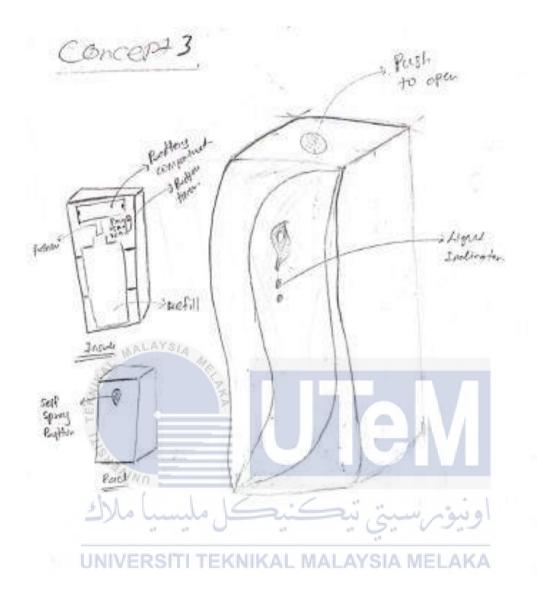


Figure 4. 31 Sketching for concept 3

4.8 Pugh Method.

Decision matrix is a kind of prioritization matrix that allows us to choose between the list of option in product design and based on criteria regarding the functionality. The aim by doing Pugh method is to focus the result to one decision. As the morphological chart generated three different concepts, the Pugh approach was used to pick only one design concept. The table 4.34 shows the Pugh method used to choose the new design of air freshener. By rank the matrix with +1, -1 and 0. Where the -1 value represent the concept lworse than the baseline in the criteria while the +1 value shows that the concept better than the baseline criteria while the 0 value represent the concept is same as the baseline. From the table 4.34 shows the total result for the concept 2 is higher than other so concept 2 have been chosen as a new design and can proceed to 3D modeling.

Table 4. 34 Pugh method

Criteria	Datum	Concept 1	Concept 2	Concept 3
Body shape	0	+1	+1	0
Nozzle shape	نل مليوسيا ما		يور ميني م	0
Timer Setting				0
Power supply	0	0	+1	0
Refill can	0	0	0	0
compartment				
Total		0	+2	0

4.9 Technical Drawing

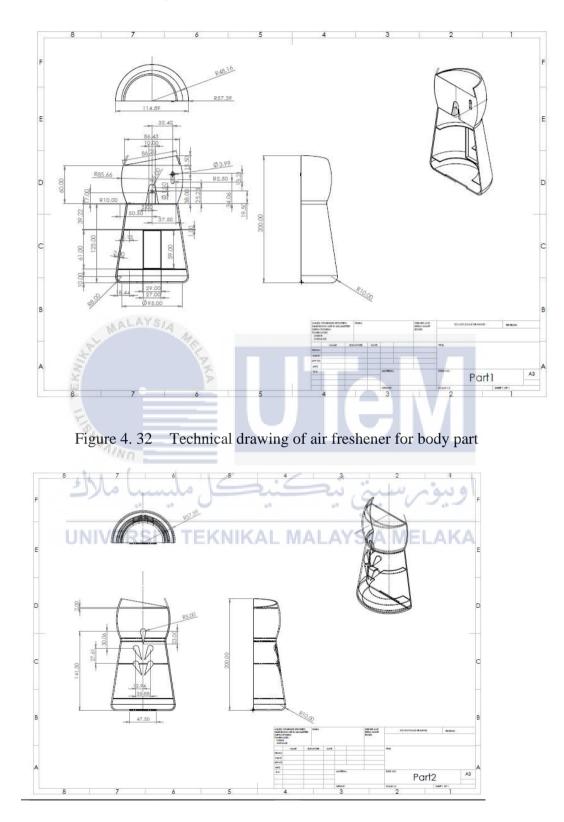


Figure 4. 33 Technical drawing of air freshener for cover part

4.10 3D modelling Design.

3D modelling is done using SolidWork software.



Prototype air freshener front.





Opened Prototype air freshener.

CHAPTER 5

CONCLUSION

5.1 CONCLUSION.

In this chapter, the summary on the findings in this project will be discussed, by referring to the first objective is to study on Kansei engineering and its application towards design on a product. As for this objective have been achieved in the study of Kansei engineering in literature review. In addition, the first objective also has been achieved in the first stem in chapter four which is when the construction of preliminary survey. the findings on the material regarding Kansei word as well as the product attribute.

Second objective is to analyze data using questionnaires by applying Kansei word embedding with Kano model. As for this objective, in chapter 4 the survey regarding Kansei and Kano model have been distributed and analyzed by using SPSS software to find the correlation between 2 variables which is Kansei and Kano variable. In spite of that, there have addition method in this product development which is Kano model method. As for this method for finding the functionality in the air freshener. As for Kano model purpose to find the customers satisfaction that meet their expectation. As the result that getting in the Kano model analysis it shows that the air freshener casing is indifferent. Which means the customers dos not really care if there have different or addition feature and function at the air freshener casing.

The last objective is to develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction). To achieve this goal, by using morphological chart to extract 3 concepts based on the feature that have been chosen by respondents. From that, Pugh method has been used to select one design in order to proceed for 3D modelling. Solidwork is the software that been used to do 3D modelling.

5.2 **RECOMMENDATION**

Kansei engineering is one of the approaches that may be utilized to enhance existing products as well as create new products based on consumer feedback or emotions. Furthermore, the Kano model is one approach for determining if a product meets the satisfaction and expectations of its customers.

- The first recommendation offered by this researcher is that product selection should be done carefully in order to carry out this technique. It is typically used to new items that have the potential to be revolutionary.
- 2. One of the most significant components in obtaining accurate results is the selection of the appropriate responders. Furthermore, the quantity of responders should be substantial. This is due to the fact that the correlation's results are also affected by the quantity of respondents.
- The final suggestion is to change the format of the survey to allow for face-to-face interviews. It is simpler to communicate with the respondent. This can also assist Kansei engineers obtain outcomes.

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APPENDICES

APPENDIX A Gannt chart for PSM 1 and PSM 2.

Activity/week	ALAYSIA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion and verification the tittle and	synopsis. Proposal preparati	ion															
Student submits proposal to Supervisor a	and Committee (mind mappi	ng)															
Identify the problem statement and the	objectives	3	E4														
Identify scope, objective		-															<u> </u>
Define the literature review, introduction						-	7		-								
Build the flowchart of project (methodol	ogy)		F														
Submit draft report 1																	
Draft questionnaire 1 (product selection)	, distribute	Si	E		4.4 A.3	10			24								-
Getting data questionnaire 1	48 48		-		. (S.		1	10	1							
The do correction, submit second draft			100		~	en/	N		A	ZA							
Draft questionnaire 2 (sentiment survey)		ENNINAL	- 1717	-	4.1.	01/	- IV		-	<u>-</u>							
Report of project																	

Activity/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Draft the preliminary questionnaire regarding product selection															\square
Construct preliminary survey															
Distribute the questionnaire															
Collect data preliminary survey	-														
Analyze data (will be used in main survey)															
Draft Main survey questionnaire (respondents' sentiment towaard product)	H			-			7								
Distributed main survey			7				-								
Getting data main questionnaire															
Analyze main survey data	4				4										
Construct the morphological chart	_														
3D modelling product design	<	-	4.9 . 4												
Report writing	_		-	5		V.	7.	2							

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Selection of Product Design Development On Air Freshener

Helio dear respondents, I am Nadiah Binti Zolkefle and third year student form Faculty of Mechanical and Manufacturing Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM) would like to conduct a survey related to the subject Bachelor Degree Project. The purpose for this survey is to classify customer/ consumer choice of the air freshener that available in the market. From this survey's result is used in product development to improvise or generate new product which is air freshener. I personally would like to say thank you in advanced and greatly appreciate your sincerely cooperation and support. Thank you.

* Required	
MALAYSIA	
SECTION A : DEMOGRAPHY	
2	
A)	
1. 1. Gander	
Mark only one oval.	
· · · · · · · · · · · · · · · · · · ·	
Female()/III	
Maje	/
كل مليسيا ملاك	اويوم سيني بيكسيك

2. 2. Age NIVERSITI TEKNIKAL MALAYSIA MELAKA

Mark only one oval.

- 18-30 31-40 41-50
- 51 AND ABOVE

3. 3. Status of residence (Status tempat tinggal)

Mark only one oval.

Dive alone (tinggal sendiri)

Live with family (Tinggal bersama keluarga)

Live with roommate (Tinggal bersama rakan)

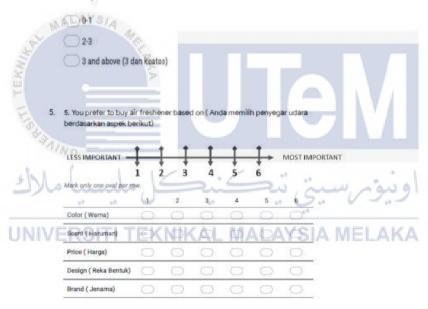
SECTION B: PRODUCT BACKGROUND

This survey aims to get the individual opinion and preferences when deciding to purchase an air freshener. Please tick in the box that represents your choice when buying a product. (Trigican ini bertujuan untuk mendepetkan pendapet den pilihan Individu ketika memutuskan untuk membeli penyegar udara. Tandakan di kutak yang mewakili pilihan anda semasa membeli produk.)

Can tick more than 1 box. (Boleh tanda lebih deri 1 kotak)

4. 4. How many air freshener do yo have in your house? (Berapakah bilangan penyaman udara yang anda ada?

Mark only one oval.



 a. The condition of the air freshener may attract my sense to buy it, is due to... (Keadaan penyegar udara mungkin menarik minat saya untuk membelinya, adalah kerana...) *

Check all that apply.

- Attractive shape (Bentuk yang menarik)
- Affordable price (Harga berpatutan)
- Trendy (Bergaya)
- Uniqueness (Keunikan)
- Reusable (Boleh digunakan semula)
- Attractive color (Warna yang menarik)
- Easy handling (mudah digunakan)

PART 2:

2: Check t El (Tin(au

KANSEI WORD freahamers. Check the boxes that represent feelings and towards the product. (Thisean Ini adalah uotuk mendapatkan pendapat den persesan setiap Individu Inihadap penyegar udars. Tendaban kotak yang mewakili persesan dan produk.)

This survey is to get the opinions and feelings of each individual towards sir

7. Five (5) words that represent your emotional feeling to the air freshener are... (Lima
 [5] perkataan yang mewakili perasaan emosi anda kepada penyegar udara adalah ...)

L.	1A. 19	Attractive and eaching in an interneting way. RecEntch and planter	
Elegant	10	Make you feel confident and delighted	
A 10 10 10	24	Popular or faction at a particular time	
2	28	Latest trend	
Trendy	20	Not really regarde	
3.	24	Creative, imiginative, inventive or original	
Eye	- 38	Aesthetically pleasing	
catching	30	Relating to or characteristics of ans or artist	
100,0002		Possessing qualities during or production of the	
4	44	about, etc.	
Beautiful	- 49	Wonderful, very pleasing and satisfying	
occentral.	46	Physical appearance is considered expensely attractive	
572	EA.	Magnificent and intposing in appearance, size, or style	
5.	104		
Grand	50	Referring to the largest or most significant item of a type	
	- 54	Outstanding, excernely pleasant or increasing Zero expression	
6.			
Plain	69	Ne decountion	
	GC .	No regular or fixed	
	TA	Jadged over a period to be the highest quality and outstanding of	
2		its kind	
Old fashion	73	Typical, classic, antique, and vintage,	
	70	A work of an of reception and established value	
8.	-BA	Having mark than one colour	
Dual colour	63	Good combination of colour	
a car carror	80	Making surporting look reliev del	
- 58 I I	94	Defined by at employing outting-edge method, sonsept, or equipment	
9.	99	Changeable from old to new development timing	
Modern	90	Denoting a current or recent style or trend in ort that marked by a	
10.022.000	1.1	tightlicant departure from trachtional styles and values	
10.	204	the condition of having or showing a variety of colours.	
Multicolour :	-308	Creating a colourful environment	
summer and	100	Colour scheme is excellent	
. Mr. AY	234	Fashionably and elegant and sophisticated	
Sivlish		Istuanced by fashionable people	
	110	Admitted by many people	
12.	- 32A	Single Operation	
Easy	328	Having & experiencing satisfaction and security	
handling	330	Handy to plant	
13.	AEC	Pleasing or appealing to the series	
	158.	Catching the attention	
Attractive	130	Showing good perthotic judgement	
14:	344	The special features	
	348	Typically occur and us cally seeing	
Ordinary		Tamifar object	
		Unlike anything else	
15.		Different appearance from other pipolat:	
Unique		Not eatly to get	
		Neteration cases	
1115		Re attractive appointance	
Simple		RetPreprior Record on appearance	
10	374	The reference operation promotion	
17.	17B	Colour is extremely thick or widdy billions	
Bright	170	Shin be an glowing ungerte	
	11.5	The second secon	والمتحدث الطاميكي المراجع

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Elegant (Mewah)

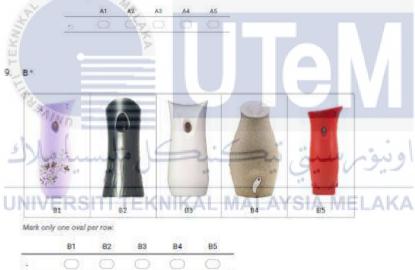
Trendy (Bergaya) Eye catching (Menarik perhatian) Beautiful (Cantik) Grand (Agung)
Flain (Kosong)
Gld fashion (Klasik) Dual color (Warna ganda)
Modern (Moden) Multicolor (Pelbagai warna) Stylish (Bergaya)
Easy handling (Mudah diselenggara) Attractive (Menarik) Ordinary (Biasa) Unique (Unik) Simple (Polos)

8. PRODUCT SELECTION

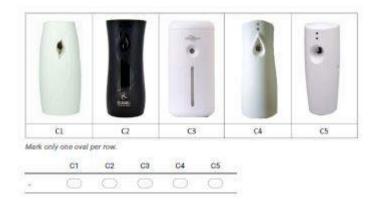
si, FROUDULT OCLECTION In this section respondent required to mark ONE (1) design of each row of automatic air fresheners product that you prefer, ID shalegien in responden dishendaki memandakan SATU (1) reka bentuk setiap baile produk penyegar udera automatik yang anda sukat.)

8. A*

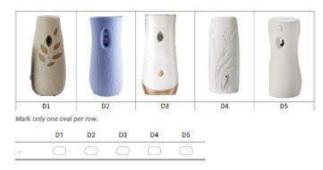






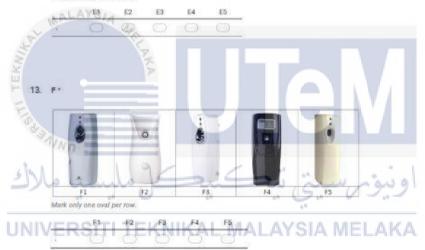


11. D*

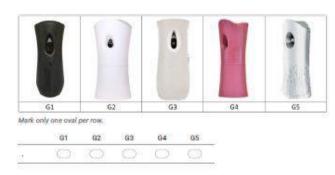


12. E*





14. G*



THANK YOU FOR YOUR TIME

APPENDIX C Main Questionnaire

AIR FRESHENER DESIGN SURVEY

Hello dear respondents, I am Nadiah Binti Zolkefie and third year student form Faculty of Mechanical and Manufacturing Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM) would like to conduct a survey related to the subject Bachelor Degree Project that supervised by Ts. Dr. Kamarul bin Amir Mohamed.

The purpose for this survey is to classify customer/ consumer choice of the air freshener that available in the market. From this survey's result is used in product development to improvise or generate new product which is air freshener. Emotional goods (Kansei Engineering) will be selected and studied in this questionnaire based on customer preferences for consumer items. This questionnaire is divided into three sections. In Section 1, you are questioned on general information, product history, and customer views. Section 2 includes the Big 5 Inventory personality traits, which is connected to consumer characteristics, and Section 3 includes 7 furniture product designs with Kansel words to explain customer preferences on product design qualities based on Kansel Engineering.

Your participation is entirely voluntary, and all information you supply will be kept completely secret. I sincerely beg your support in participating in this study. I appreciate the time you took to help me with my research and promise to use the facts i've learned to think about and make beneficial changes. I personally would like to say thank you in advanced and greatly appreciate your sincerely cooperation and support.

Thank you



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2. 2. Age (Umur) *

Mark only one oval	
18-30	
31-40	

51 AND ABOVE

3. 3. Occupation Status (Pekerjaan) *

Mark	only	one	oval.	

- C Student
- Unemployed
- Under Employment
- Self-employment
- Profession
- Retired

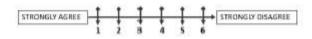
B: Product background



SECTION 3 : PRODUCT ATTRIBUTE

This section requires you to rate on the words that describes the product.

7. Please rank the following words on a scale of 1 to 6 to indicate how much you agree or disagree with that statement. (Sila kedudukan perkataan berikut pada skala 1 hingga 6 untuk menunjukkan sejauh mana anda bersetuju atau tidak bersetuju dengan pernyataan tersebut.)



6. PRODUCT A*



Mark only one oval per row.

	1	2	3	4	5	6
Beautiful	0	0	0	0	0	0
Plain	0	0	\bigcirc	0	0	0
Old fashion (Classic)	0	0	\bigcirc	\odot	\bigcirc	0
Eye catching	0	0	0	0	0	0
Elegant	0	0	\odot	0	0	0
In overall, do you like this product?	0	0	0	0	0	0



INTA PLACE INC. 1	C. (), () (– m		1.01	er nur	- La Pill
	1	2	а	4	5	6	
Benutiful	0	0	0	00	0	0	

Beautirui		100		0	0	100
Plain	0	0	0	0	0	0
Old fashion (Classic)	0	0	0	0	0	0
Eye catching	0	\bigcirc	\bigcirc	0	0	0
Elegant	0	\odot	0	0	0	0
In overall, do you like this product?	\bigcirc	0	\bigcirc	\odot	0	\bigcirc

8. PRODUCT C *



Mark only one oval per row.

Beautiful Plain Old fashion (Classic) Eye catching Biegant	0000	0	0 0	0	0	0	
Old fashion (Classic) Eye catching	0	0	0	0	0		
Eye catching	0	\bigcirc	0	0	10000		
-	5			-	\odot	0	
Flowert	×_×	\bigcirc	0	\bigcirc	\bigcirc	0	
the second s	0	Ø	0	0	\bigcirc	0	
In overall, do you like this	0	0	0	0	0	0	
9. PRODUCT D*							V
Alunersiti TE	کل	2		-	ġ.		ونيونه

Mark only one oval per row.

	1	2	з	4	5	6
Beautiful	0	\odot	0	0	\odot	\bigcirc
Plain	0	0	0	0	0	0
Old fashion (Classic	\odot	0	\bigcirc	0	\bigcirc	O
Eye catching	\bigcirc		0	\bigcirc	\bigcirc	0
Elegant	0	0	0	0	0	0
In overall, do you like this product?	Ø	\odot	\bigcirc	0	0	\odot

10. PRODUCT E*



Mark only one oval per row.

leautiful			3	4	5	6
	0	\bigcirc	Ð	0	0	0
lain	\bigcirc	0	\bigcirc	0	\bigcirc	0
Nd fashion (Classic)	0	0	0	0	0	0
ye catching	0	0	\bigcirc	0	0	0
legant	\bigcirc	0	0	0	0	0
n overall, do you ske this roduct?		0	\odot			0

للأك	ميا ه	ل مليا	نيك	تيك	يجي	اونيوس
UNIV	ERSP		NIKAL	MALA	/SIA	MELAKA

Mark only one oval per row.

	1	2	з	4	5	6
Beautiful	0	0	0	0	0	0
Plain	0	0	0	0	0	0
Old fashion (Classic)	0	0	\odot	0	\odot	0
Eye catching	0	0	\odot	0	0	0
Elegant	0	0	0	0	0	0
In overall, do you like this product?	\odot	0	\odot	0	0	0

130

PRODUCT G *



Mark only one oval per row.

Beautiful Plain Old fashion (Classic) Eye catching Elegant In overall, do you like this product? SECTION 4: Product Design (Kanc SECTION 4: Product Design (Kanc UNER Step 1 TEK	Ouestions					
Old fashion (Classic)			0	0	0	
Eye catching			0	0	0	
Elegant		0	0	Ö		
In overall, do you like this product? SECTION 4: Product Design (Kanc SECTION 4: Product Design (Kanc IVER Step 2 TEK		0				
SECTION 4: Product Design (Kans						
SECTION 4: Product Design (Kans	Questions	aire)	ure andrews r		2	
OFF. SMINUTES	-[€ F	یی تیا	~~~	نيونر. بيونر،
	NIK NOZZ	000		AYS	IAN	IELA
Step 4		-				

8. This section requires you to answer the simple Kano Questionnaire. Please tick the rating as the selected answer. (Bahagian ini memerlukan anda menjawab Soal Selidik Kano yang mudah. Sila tandakan penilaian sebagai jawapan yang dipilih)

1	2	3	4	5
LLIKER	IT MUST BE	I'm NEUTRAL	I CAN LIVE WITH IT	I DISLIKE IT
that way	that way		that way	that way

13. FUNCTIONAL: HOW DO YOU FEEL IF*

Mark only one oval per row.

	1	2	3			
The air freshener have timer setting	\odot	0	0	0		
The air freshener use battery	\odot	0	0	O	\bigcirc	
The air freshener easy to replace the refill can	\bigcirc	0	\bigcirc	\bigcirc	0	
The timer can self setting	0	0	0	0	0	
The air freshener can hanging on the wall	0	0	0	Ö	0	
The air freshener have self spray button	0	0	0	0	0	
The shape design of air freshener is curvy and round shape	\odot	0	0	\bigcirc	0	
The air freshener have battery indicator	0	0	0	\bigcirc	0	
The air freshener have spray refill indicator	0	0	0	\odot	0	
The air freshener design is suitable for decoration	\bigcirc	\odot	\bigcirc	\odot	0	
The air freshener design look like vase	0	0	0	0	0	
section requires you to answer the selected answer.						
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

14. DYSFUNCTIONAL: HOW DO YOU FEELS IF *

Mark only one oval per row.

	1	2	з	4	5	
The air freshener not having timer setting	0	0	\bigcirc	\odot	\bigcirc	
The air freshener using charger battery	\odot	\bigcirc	\bigcirc	\bigcirc		
The air freshener complicated to replace the refill can	0	\bigcirc	0	\odot	0	
The timer setting already have options	\bigcirc	0	\bigcirc	0	\bigcirc	
The air freshener cannot hanging on the wall	0	0	\odot	\bigcirc	0	
The air freshener doesn't have self spray button	0	0	\odot	0	0	
The shape design of air freshener is rectangular shape	0	0	\odot	0	0	
The air freshener doesn't have battery indicator	0	0	\odot	0	0	
The air freshener doesn't have spray refill indicator	0	0	Ö	\bigcirc	0	
The air freshener design is not suitable for decoration	0	0	0	0	0	
The air freshener design do not look like vase	Ö	0	õ	0	0	
The air freshener design da not look like vase	seared norm			E	H	
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APPENDIX	D SPSS	data	correlation
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		K1-timer setting	Correla	D1_Plain	D1_Classic	D1_Eyecatchi ng	D1_Elegant	D1_Overall
K1-timer setting	Pearson Correlation	1	.186	.318	.163	.204	110	.122
	Sig. (2-tailed)		.148	.012	.206	.111	.396	.345
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.186	1	.338**	.320	.325**	.264	.405**
	Sig. (2-tailed)	.148		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.318	.338	1	.178	037	.186	.342**
	Sig. (2-tailed)	.012	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.163	.320	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.206	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.204	.325	037	.122	1	.013	.176
	Sig. (2-tailed)	.111	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	110	.264	.186	.038	.013	1	.223
	Sig. (2-tailed)	.396	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	.122	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.345	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

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Dutput 1 Log Correlations Title Notes Correlations	Correlations	کا ملہ	K2-charger	Correlat	tions		D1 Evecatchi	0	
Log	-	. 0	battery	D1_Beautiful	D1_Plain	D1_Classic	ng	D1_Elegant	D1_Overall
Correlations	K2-charger battery	Pearson Correlation	1	.022	.046	.101	.036	.003	048
Title		Sig. (2-tailed)		.867	.720	.435	.782	.981	.714
Correlations	ERSIT/	NTEKN	62	62	62	62	62	62	62
Log	D1_Beautiful	Pearson Correlation	.022	1	.338**	.320	.325**	.264	.405**
Correlations		Sig. (2-tailed)	.867		.007	.011	.010	.038	.001
Notes		N	62	62	62	62	62	62	62
Correlations	D1_Plain	Pearson Correlation	.046	.338	1	.178	037	.186	.342
Correlations		Sig. (2-tailed)	.720	.007		.166	.776	.149	.007
Title		N	62	62	62	62	62	62	62
Notes	D1_Classic	Pearson Correlation	.101	.320	.178	1	.122	.038	.393
Correlations		Sig. (2-tailed)	.435	.011	.166		.346	.772	.002
Correlations		N	62	62	62	62	62	62	62
Title	D1_Eyecatching	Pearson Correlation	.036	.325	037	.122	1	.013	.176
Correlations		Sig. (2-tailed)	.782	.010	.776	.346		.923	.171
		N	62	62	62	62	62	62	62
E Correlations	D1 Elegant	Pearson Correlation	.003	.264	.186	.038	.013	1	.223
👘 Title		Sig. (2-tailed)	.981	.038	.149	.772	.923		.082
Correlations		N	62	62	62	62	62	62	62
Log I	D1 Overall	Pearson Correlation	048	.405	.342	.393	.176	.223	1
Correlations		Sig. (2-tailed)	.714	.001	.007	.002	.171	.082	
Title		N	62	62	62	62	62	62	62

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Ite Title Ite Notes			K3-to replace therefill can	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatch	D1_Elegar	t D1_Overall
	K3-to replace therefill	can Pearson Correlation	1	.219	.208	.253	.129	.01	.178
E Log		Sig. (2-tailed)		.087	.105	.047	.317	.94	1.166
Correlations		N	62	62	62	62	62	6	
- R Notes	D1_Beautiful	Pearson Correlation	.219	1	.338	.320	325	284	405
-+ Correlations		Sig. (2-tailed)	.087		.007	.011	.011	.03	8 .001
Correlations		N	62	62		62	6		
···· @ Title	D1_Plain	Pearson Correlation	.208	.33B ^{°°}	:1	.178	037		
		Sig (2-tailed)	.105	.007		.166	771		
E Log		N	62	62	62	62	63		
Correlations	D1_Classic	Pearson Correlation	.253`	320	.178	1	.123		
E Title		Sig (2-tailed)	.047	.011	.166		.34	2	
Correlations	D.J. Turantables	N Pearson Correlation	62	62	62 037	62	6:		the second s
Correlations	D1_Eyecatching		.129	.010		.346		.01	t Carrows to the
@ Title		Sig. (2-tailed)	.317	.010		.346	6:		
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Call Correlations	DI_Liggen	Sig. (2-tailed)	.941	.204	.149	.030	92:		.082
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(C) Title (C) Notes	D1 Overall	Pearson Correlation	.178	.405"	.342"	.393"	.178	i	- 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 1973 - 197
Correlations		Sig (2-tailed)	.166	.001	.007	.002	17	8 874	
🖻 Log				62	62		63	10.2	511000
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SESI PENGAJIAN: 2021/22 Semester 1

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285 A JALAN 2 TAMAN LEMBAH

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DESIGN AND DEVELOPMENT OF AIR FRESHENER'S CASING BY USING KANSEI ENGINEERING AND KANO MODEL



BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PROCESS AND TECHNOLOGY) WITH HONOURS

2021/2022



Faculty of Mechanical and Manufacturing Engineering Technology



Nadiah Binti Zolkeflee

Bachelor of Manufacturing Engineering Technology (Process and Technology) With Honours

2021/2022

DESIGN AND DEVELOPMENT OF AIR FRESHENER'S CASING BY USING KANSEI ENGINEERING AND KANO MODEL

NADIAH BINTI ZOLKEFLEE



Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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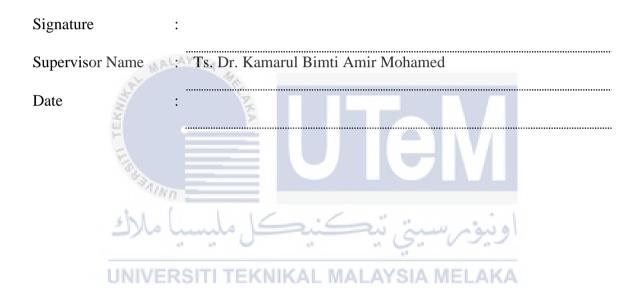
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I declare that this thesis entitled "Design And Development of Air Freshenre's Casing By Using Kansei Engineering" is the result of my own research except as cited in the references. The choose an item has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



APPROVAL

I hereby declare that I have checked this thesis, and, in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honors.



DEDICATION

This report is dedicated to my beloved parents in particular, for their endless love, support and encouragement. To my lecturer Ts. Dr Kamarul Bin Amir Mohamed who has guided me along the way to finish this project. Thank you for your support and give me strength until this project is finished.



ABSTRACT

Most of the design concepts available in the market come from the ideas of designers who sometimes have opinions that are contrary to the definition of custom design concepts and as a result, it is always confusing. The purpose of this research conducted is to improve the design of air freshener casing that meets customer demand by using Kansei Engineering. Kansei Engineering is a tool used to interpret human feelings and opinions from users or customers into design parameters. The result of this study is the design of the air freshener casing, which satisfies the psychological feelings of the customers. With reference to the main objectives in this research, three objectives have been proposed. First, to study on Kansei engineering and Kano model in air freshener's casing product design. The second objective was to analyse data using questionnaires by applying Kansei word embedding with Kano model. The final objective of this study was to develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction). The Kansei survey consists of two parts. In the first part, a pre-survey was conducted to collect data on customer preferences for air freshener products available in the market. With reference to the highest scores from the survey for each question related to Kansei Engineering, it will be used in the main survey phase. A second survey was conducted to collect data on customer thought and opinions regarding the products selected in the presurvey. To analyse the results in the second survey, use the SPSS software to find correlations between the two variables. Successful results were obtained, by using morphological chat to construct 3 concept design for new design of the air freshener casing. Overall, Kansei engineering is one of the methods that can be used to obtain user or customer opinions as well as thought to be transformed into new designs that suit the customer's . O. V demand. - 10 and so and

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ABSTRAK

Kebanyakan konsep reka bentuk yang terdapat di pasaran datangnya daripada idea pereka yang kadangkala mempunyai pendapat yang bertentangan dengan definisi konsep reka bentuk tersuai dan akibatnya ia sentiasa mengelirukan. Tujuan penyelidikan ini dijalankan adalah untuk menambah baik reka bentuk selongsong penyegar udara yang memenuhi permintaan pelanggan dengan menggunakan Kansei Engineering. Kansei Engineering ialah alat yang digunakan untuk mentafsir perasaan dan pendapat manusia daripada pengguna atau pelanggan ke dalam parameter reka bentuk. Hasil kajian ini adalah reka bentuk selongsong penyegar udara, yang memenuhi perasaan psikologi pelanggan. Merujuk kepada objektif utama dalam penyelidikan ini, tiga objektif telah dicadangkan. Pertama, untuk mengkaji kejuruteraan Kansei dan model Kano dalam reka bentuk produk sarung penyegar udara. Objektif kedua adalah untuk menganalisis data menggunakan soal selidik dengan mengaplikasikan penyematan perkataan Kansei dengan model Kano. Objektif akhir kajian ini adalah untuk membangunkan prototaip 3D reka bentuk penyegar udara menggunakan kejuruteraan Kansei (emosi) yang dibenamkan dengan model Kano (kepuasan). Tinjauan Kansei terdiri daripada dua bahagian. Pada bahagian pertama, pra-kaji selidik telah dijalankan untuk mengumpul data tentang pilihan pelanggan terhadap produk penyegar udara yang terdapat di pasaran. Dengan merujuk kepada markah tertinggi daripada tinjauan bagi setiap soalan berkaitan Kejuruteraan Kansei, ia akan digunakan dalam fasa tinjauan utama. Tinjauan kedua telah dijalankan untuk mengumpul data tentang pemikiran dan pendapat pelanggan mengenai produk yang dipilih dalam pra-kaji selidik. Untuk menganalisis keputusan dalam tinjauan kedua, gunakan perisian SPSS untuk mencari korelasi antara dua pembolehubah. Keputusan yang berjaya diperolehi, dengan menggunakan sembang morfologi untuk membina 3 reka bentuk konsep untuk reka bentuk baharu selongsong penyegar udara. Secara keseluruhannya, kejuruteraan Kansei merupakan salah satu kaedah yang boleh digunakan untuk mendapatkan pendapat pengguna atau pelanggan serta difikirkan untuk diubah menjadi reka bentuk baharu yang sesuai dengan permintaan pelanggan.

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CHAPTER 1

INTRODUCTION

1.1 Background

In the few years ago before industry know about how getting customers satisfaction, usually designer will do the design by thinking it themselves. Sometime the design quite often does not usually meet great approval in the market. Furthermore, product designers are struggling searching to get a greater understanding of the individual feelings of users. In term of innovative product growth, the modern era is moving from a product-out to a market-in approach. It amplifies the user's needs to the same level as the other technical requirements of a good business marketing (A. M. Lokman, 2009). Consumer satisfaction is described as a consumer's attitudes, research, and emotional reaction after a purchase based on a combination of a product's actual output feeling with the hope and evaluation experience of purchasing a product. Apart from that, company royalty is often a mentality and consumers' attachment, or belief based on feelings of enjoyment, popularity, and proud in being a customer of the famous brand. (A. M. Lokman & Aziz, 2010)

It is difficult to estimate implied demand because users' feelings are more difficult to quantify than over needs, which are easier to explain. Kansei engineering is a method that can used to evaluate feeling and impression of customers about a product (Schütte et al., 2004). Kansei engineering was invented by Nagamachi at Hiroshima University about 30 years ago, for a new product development (Matsubara & Nagamachi, 1997). Kansei engineering method can interpret customer's feeling and opinion into a data set that make easier to product designer know well about customer's demand. The aim in this method is

to get customers' opinion about existing product then produce new design or new product in market (Nagamachi, 1999).

Many product that applies Kansei engineering were sold well in Japan(A. Lokman, 2010). With this method become a main aim of research to collect customer's opinion or feeling about the design of automatic spray air freshener. Most of the house, office, and hotels in Malaysia have air freshener. The main purpose air freshener place in enclosure room such as kitchen, living room and bedroom is to reduce the unpleasant odor in house (Alshaer et al., 2019). There have many types of air freshener can be use such as spray, gel form and evaporative diffuser. Most of the user prefer an attractive design for air freshener as decoration. So far, there has not been a version of an automatic air freshener that uses the Kansei approach based on current literature. So, this research is performed to evaluate the users emotional then transfer it into the design elements combined with emotion influence to improve an automatic air freshener. Figure 1.1 shows the concept of Kansei Engineering generally.

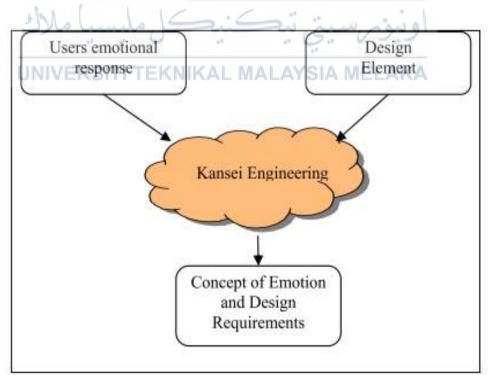


Figure 1. 1 Concept of Kansei Engineeering (Nagamachi, 2003).

2

1.2 Problem Statement

There have several techniques can be applied to improve product as well as sell Kansei engineering is one of them. Moreover, Kansei Engineering is not a popular method used in Malaysia.

Air freshener is one of essential need in every house. Users look for appearance of casing air freshener then the scents. Most air freshener existing in market do not have an attractive design. Design that seller produce does not have decoration friendly. The production more focus on function of the air freshener. Some users need a new design of air freshener that can fit their interior decoration.

To find out the suitable product for users, should be given opportunity for users to select their own desire design for air freshener by applying Kansei engineering element during the survey. In addition, the product development of air freshener casing also will be referring customers opinion and feelings. Usually, designer or home fragrance manufacturer do not focus on the outer design but the smell of fragrance.

1.3 Research Objective

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In this research have three main objectives need to be achieve at the end of this research:

- To study on Kansei engineering and Kano model in air freshener's casing product design.
- To analyze data using questionnaires by applying Kansei word embedding with Kano model
- 3. To develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction).

1.4 Scope of Research

This research is mainly to study Kansei engineering and Kano model method in order to improve existing product which is air freshener casing. So, in the end of this research the acceptable design and decoration friendly of outer casing for air freshener.

Relation between customer's desire, feeling and judgement with the product will be study further about Kansei Engineering in product development. As to collect the selected sample from users that related to domain product air freshener is using google from. Same as data collection for sentiment survey is using google form. Result from sentiment survey will analyze using SPSS software to getting the correlation between adjective opinion to the product.

Designing air freshener casing that have attractive appearance without change the function and relevant. Solidwork is applied when getting finalize relevant design for new design. Finally, running final survey about getting the opinions from users.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, will be discussing about the literature review studies. It will explain the summary based on previous study that has a better experience. Besides, the basic theory that has relations with research that will be explained regarding the basic theory that has connections with research that would be done from textbooks and other resources is discussed in a literature review. The purpose of this chapter is to find out the difference between previous study with the research that would be conducted.

2.2 Consumers Demand in Product Development

Consumers are the most important factor in the development of new products and determining product success requires an awareness of customer desires. Consumer interest in product growth, on the other hand, does not necessarily provide the desired results; however, contact with customers may mitigate the unexpected and generate foresight to help address potential consumer needs (Booz, 1982). Customer orientation is critical for a market orientation approach, and different approaches have been used to determine consumer needs. Nonetheless, a competitive economy with a large number of customers necessitates special measures to comprehend customer demand for new product growth.

New Product Development (NPD) refers to a company's operations that result in a continuous stream of new or modified product retail offerings over time. This includes the creation of opportunities, their collection and transformation into objects (manufactured products) and activities (services) for customers, as well as improving institutionalization of

new product development activities (Bangad, 2010). Successful innovative technologies are a critical component to a company's development and productivity. And so, not all new products can succeed on the business; for example, the probability of a new product loss is balanced against the potential for economic growth.

Even though the risk is embedded in new product development, it can be quantified by using a formal method for handling new product behaviors. Figure 2.1 illustrates the Booz, Allen and Hamilton's New Product Process, which separates new product creation into seven stages: Idea generation, screening and evaluation, business analysis, development, testing, and commercialization are all steps in the development of a new product strategy (Booz, 1982).

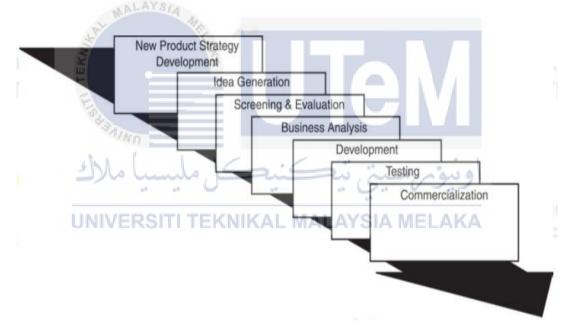


Figure 2.1 New Product Process (Booz, 1982).

In the first stage is new product development. Creating the framework for the new product development process by evaluating missions and related objectives, as well as identifying roles that new products could play in achieving specific goals. This material highlights the strategic needs for new product as a guide for following stages of product innovation. Generate the idea is the second step in the process of developing a new product. In order to discover a suitable and useful concept, an organization would usually produce a lot of them. The most creative companies also use a variety of sources of inspiration from emerging products, as well as a variety of methods to process such ideas. They must also boost employee ingenuity in order to operate the pipeline that feeds innovative product design and production(Bangad, 2010).

Idea screening is the following step after getting the list of idea. In this stage This is the first evaluation of a modern product concept. It entails filtering new product concepts in order to identify the best ones and exclude the bad ones as quickly as possible. Only concept concepts that will turn into useful goods are used in this process. The concept of development and testing. At this point, the product concept is transformed into a verbal or visual representation, with initial ideas for impediments, products, and technologies. Furthermore, emerging design ideas were checked with prototypes of potential audiences in idea testing to see whether they had a good impact on them.

Marketing strategy and business analysis is involves developing an initial marketing plan for a new product based on the product idea. The marketing campaign statements are split into three sections which are an overview of the target market, the expected product placement, as well as revenue, market share, and benefit (Booz, 1982). This provides a study of new product revenue, prices, and earnings estimates in order to determine if these aspects meet the firm's goals.

Product development phase in this phase it involves the assembly of all the component and other works that related (Booz, 1982). It will transform into tangible shape and samples in this section to ensure that the product theory can be turned into an actual product.

Marketing testing is the process when the product prototype and marketing division was simulated in a more practical and real-time business scheme at this point of new product growth.

Commercialization is the final stage. This section simply refers to the launch of a new product into the industry using some campaign advertising tactic. A new product may be sold quickly, exclusively, or carefully in order to promote it(Bangad, 2010).

2.2.1 Kansei Engineering

Kansei Engineering (KE) is one of method product development process which related to consumer emotion and opinion. By referring to Japanese word Kansei means consumer's emotional feeling and image about a product(Nagamachi, 2003). Kansei Engineering is mostly used as a catalyst for the systemic development of new and creative ideas, but it can also be used to enhance current products and concepts (Zhabiz Shafieyoun, 2014). The study of product emotion has shown that emotional design outshines useful and usable design. Figure 2.2 shows the Kansei Engineering system(Neto, 2015).

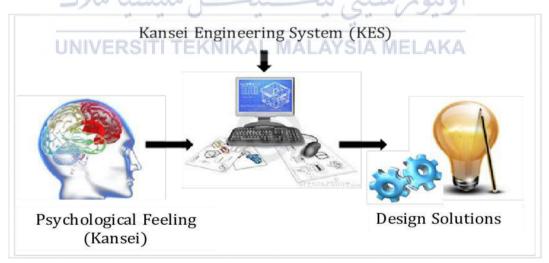


Figure 2. 2 The Kansei Engineering System (Neto, 2015).

The idea for a new product can be design according to customer's feeling and image by applying Kansei Engineering technology. According to the definition of Kansei Engineering from Nagamachi " translating technology of a consumer's feeling (Kansei in Japanese) of the product to the design elements (Nagamachi, 1999). Kansei Engineering is an evaluation about some product in form of subjective comment or perception by referring to the interaction between the purpose or experience. In total, Kansei Engineering (KE) has become a strong product and service design technique that collects and converts potential users' and customers' emotional demands and sentiments into customer experience design features and features.

2.3.1 Definition of Kansei

In Japanese culture, the word Kansei is difficult to translate to the other language. Kansei is referred to as sensitivity, sensibility, and feeling in certain dictionaries, while having varying meanings from different literature, including sensitivity, meaning, sensibility, feeling, aesthetic, sentiment, love, and intuition in English(Neto, 2015).

In term psychology, Kansei can be define as the mental state this is knowledge, emotion, and sentiment are synchronized. Those people who rich Kansei is people full of emotion and sentiment adaptive as well as warm and responsive. The closest word to Kansei is 'psychology feeling' people have with a product. Emotion is described in its psychological school of thinking as unconscious thoughts about objects, and this definition is similar to the Kansei principle.

The change of era there have revolution in design in some industry like fashion, decoration, building and etcetera. So, Kansei is reflection of the era and change occasionally such as trend related. Furthermore, differences in Kansei can occur as a result of differences in culture and social behavior between individuals and nations, and there are Kansei that are nearly identical but vary in terms of the Kansei words represented. As a result, when applying K.E. abroad, topics such as culture and timeliness are some of the sensitive matters that must be considered.

2.3.2 Kansei Engineering Invention

Professor Misuto Nagamachi of Hiroshima University invented the system in Japan in the early 1970's, as a consumer-oriented technology for new product development and it has since been applied by a lot of Japanese firms (Nagamachi, 2003). The method became popular in the United States and Europe in the mid-1990's. Kansei Engineering has

progressed significantly in its three decades of existence.

Nowadays, many products were invented by using Kansei Engineering technology method. As a great example, a Japanese automotive manufacturer, Mazda using Kansei Engineering to develop a new sports car named "Mitaya'.

The main purpose of Kansei Engineering to innovate and produced a new product based on the feelings and demands of customers. To proceed with this method there have four points that concerning(Nagamachi, 2003). First, to understand the customer's feelings (Kansei) regarding the goods in terms of economic and psychological evaluation. Second is how to figure out the product's design features from the Kansei of the customer. Third is how to make Kansei Engineering a user-friendly technology. Lastly, what to do to adapt product design to contemporary cultural shifts or consumer preferences

2.3.3 Kansei Mechanism

Kansei refers to the psychological state in which knowledge, feeling, and sentiment are in balance. Kansei as a mental function, most exactly as a deeper mental function according to Harada (Anitawati, 2009). As a result, it is an implicit function of the brain. Kansei begins with the five senses acquiring sensory functions such as sensations, emotions, and intuition (i.e., vision, hearing, smell, taste, and skin sensation). Psychological brain function involving perception, judgement, and memory will emerge when these senses are aroused. In the case of entering a new boutique, your senses of sight, smell, fashion style, and cognition would determine if the establishment were "very welcoming" or provides "excellent service ". Figure 2.3 shows the process of Kansei in form of brain sensory (A. Lokman, 2010).

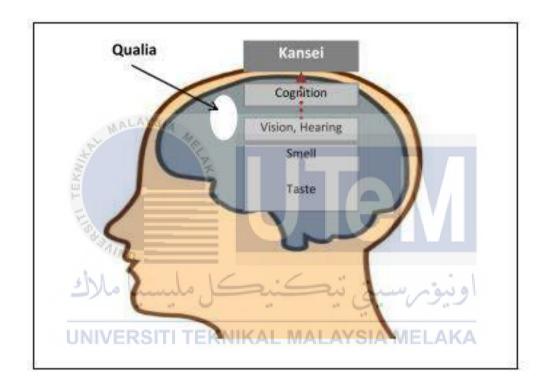


Figure 2. 3 The Process of Kansei (A. Lokman, 2010)

2.3.4 Concept of Kansei Engineering

Kansei Engineering attempts to develop a modern product focused on the feelings and demands of consumers. Kansei can be explained using the human brain as a model and our brain creates interest, feelings, and emotion, which are known as Kansei. Regarding this method, there are four things to consider which is, first is how to grasp the consumer's feeling about the product in term of psychological estimation. Second, the way to identify and analyze the product's design feature from the Kansei of the customer. Third, how to build Kansei Engineering as an ergonomic and update technology. Lastly, fourth is how to adapt product design to new cultural changes or consumer preferences. Figure 2.4 shows Concept of Kansei Engineering (Chuah et al., 2008).

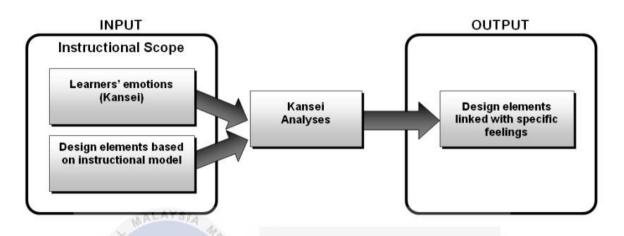


Figure 2. 4 Concept of Kansei Engineering (Chuah et al., 2008).

2.3.5 Type of Kansei

Nagamachi discovered six different varieties of Kansei Engineering procedures have now been checked and are ready for use (Neto, 2015). Table 2.1 below show the type of Kansei Engineering that currently available.

Table 2.1	Type of Kansei	Engineering System	(Anitawati, 2009)
-----------	----------------	--------------------	-------------------

Туре	Type Name	Description
Ι	Category classification	• Identifying the design elements of the product to
		be developed, translated from consumer's
		feelings and image.
II	Kansei Engineering System	• A computer aided system with a so-called
		interference engine and Kansei databases.

III	Kansei Engineering	• Mathematical modelling with an interference
	modelling	engine and databases
IV	Hybrid Kansei Engineering	• The combined computer system or forward
	System	Kansei, which goes from the user's impressions
		to design specifications and vice versa.
V	Virtual Kansei Engineering	• An integration of virtual reality technology and
		Kansei Engineering in a computer system
VI	Collaborative Kansei	• Group work design system utilizing intelligent
	Engineering Designing	software and databases over the internet

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Kansei Engineering's future development and application to other areas would necessarily require the integration of more technologies and approaches from other fields. Kansei Engineering's future development and application to other areas would require integrating more technologies and approaches from other fields. This might be key to Kansei Engineering's growth.

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2.3.6 Application of Kansei Engineering in Product Development

1. Automotive vehicle design. (Type 1 KE)

Japanese automotive manufacturers wanted to implement Kansei Engineering into the production of automotive vehicles. Nissan, Mazda, and Mitsubishi were ready to apply Kansei Engineering and started producing a variety of newly designed vehicles. Nissan has extended the latest ergonomic technology to all new products. Kansei Engineering was first developed by Mazda for the creation of "Persona" and later for "Miyata". In addition, Mitsubishi practiced Kansei Engineering before any other automobile manufacturer and decided to apply it in the "Diamante," which would have been a success. Toyota and Honda, several other Japanese manufacturers, were also interested in learning about Kansei Engineering Type I and then used it to develop their products. Figure 2.3 shows example translation of Kansei into car physical trade (Nagamachi, 2003).

	Kansei			Physical	Ergonomic	Automotive
Zero	lst	2nd	nth	traits	expriment	engineering
[- Tight feeling		• •	Width experim Height Interior k	Tight feeling experiment Interior kansei expeiment	Sheet design Interior design Power train development Steering yaw ratio
нми-	Direct feeling		•••	Steering design Shift lever	Steering function Shift lever	
ŀ	Speedy feeling -	14 14		Speed meter	length	Steering design Shift lever design
L	Communication	E		Frequency Open style	Minus gravity Noise frequency analysis	Speed meter design exhaust pipe design

Figure 2. 5 Translation of Kansei into car physical trade (Nagamachi, 2003).

2. Computer assisted KE. (Type II)

The Kansei Engineering is a computerized system that uses the expert system to convert the feeling and image of the customer to the design data. It can be related to Kansei Engineering type II which is is a computer supporting system for designer's designing Kansei product. Figure 2.5 below show the four database of computerized KE system (Nagamachi, 1999).

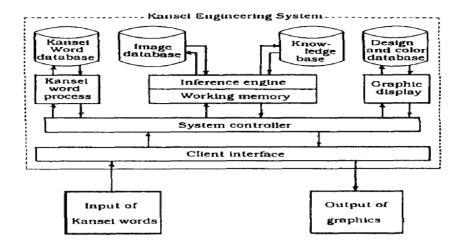


Figure 2. 6 Flow Kansei type ii (Nagamachi, 1999)

Type II Kansei Engineering has been used to create a costume for a college girl, house design, entrance door design, car interior design in Nissan, office chair design, the color planning, interior design in a construction machine, and automatic door design. Knowledge computing tools used by the KES include Expert Systems, Neural Networks, and Genetic Algorithms. Whenever a designer enters his or her Kansei terms into the scheme, the KES calculates them using the inference engine and databases, and then displays a graphic as the result of the calculation.

3. Mathematical modelling (Type III) KAL MALAYSIA MELAKA

Fukushima and his colleagues explain the Type III case in detail. They managed to introduce intelligence into a color printer in order to create a better color image. They performed an experiment in which the participants used the Kansei SD (Semantic differential) scales to rate different girl's face skin colors (Nagamachi, 1999). Figure 2.7 shows example semantic differential scale (Tama et al., 2015). The tested colors were divided into three categories: shade, value, and chroma, which were then represented using a triangle fuzzy membership function. Using the SD scale, we performed an ergonomic study on face color analysis. We succeeded in Kansei realization of making more balanced and beautiful color copy implementing the face color tuning method in the CPU of the new color copy machine. Nagamachi also used a Fuzzy Logic system to model Japanese term feeling (Nagamachi, 1999).

NEGATIVE	1	2	3	4	5	POSITIVE
Affordable, inexpensive						Expensive
Antique, classic		0				Modern, contemporary
Plain						Patterned
Dull		0				Attractive
Ugly						Beautiful
Uncreative		i i	j j		8	Creative, innovative
Not harmonious						Harmonious
Inclusive		i i	j j			Exclusive
Complex		1				Simple
Not appealing		i i	j j			Appealing, dazzling
Not Aesthetics		1				Aesthetics
Not inspiring		i i	j j			Inspiring
Untidy		1				Tidy
Rigid		1 1				Dynamic
Common						Limited edition

Figure 2. 7 Semantic Differential Scale (Tama et al., 2015)

2.3.7 Kansei Principal

The literature shows that K.E.'s process explanation is mostly summary. Figure 2.8 below shows the outline for principle of KE implementation that is possible in all development cycle for different kinds of product (Anitawati, 2009).

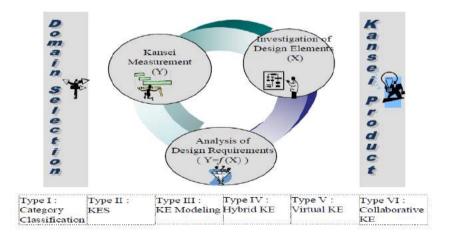


Figure 2.8 Principal of KE (Anitawati, 2009)

In a particular domain, the approach involved the phases of Kansei Measurement, Investigation of Design Elements, and Analysis of Design Requirements, with the aim of producing Kansei products (Anitawati, 2009). At the bottom, various categories of K.E. are arranged to display different types of K.E. techniques. Below states the detail of each component from the main principal.

First, domain product selection during this process, identifying the specific domain product that need to be study using Kansei Engineering technique. Since Kansei answer is unique for different products, it is limited a study to a single domain. As stated above there are six types of KE. Any kind of K.E. to use is determined by the industry's or Kansei Engineer's strategies for completing all processes (Schütte et al., 2004). M.Huang, H.Tsai and T.Huang (2011) applied Delphi method to making a decision by avoiding predicted erroe as well as less arguments (Huang et al., 2011).

Second is collection of Kansei word. The Kansei word applies to describe the product domain. These words are mostly adjectives, but they may also take other grammatical forms but also verbs and noun can occur. All relevant references must be used to obtain a full set of terms, even though the words that occur appear to be related or identical. Figure 2.9 below represent sample flow of selection Kansei word (Schütte et al., 2004).

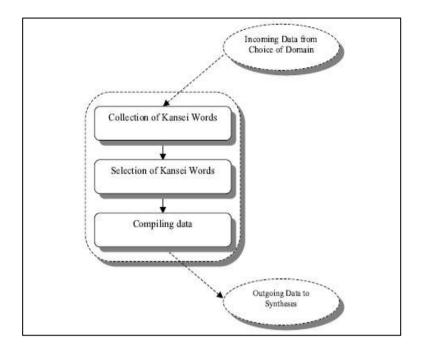


Figure 2. 9 Simple Flow of Selection Kansei word (Schütte et al., 2004).

The number of existing Kansei terms ranges between 50 and 600, depending on the domain in question. Since it is critical to compile all existing words, the process is repeated until no new words appear. If key words are omitted from the report, it would have a significant impact on the quality of the findings.

The third principle is measuring Kansei. The method of capturing a consumer's internal feeling is known as Kansei Measurement. It is difficult to calculate Kansei explicitly since it is subjective, complex, and unstructured. As a result, we must formulate indirect calculation approaches based on a different speech methodology. The list above is sorted according to the complexity of behavioural patterns. Kansei Engineering is focused on analytical product and model property estimations, and it assists consumers in expressing their expectations on items they may not be aware of. As a result, semantic methods such as Osgood et al (1969).'s Semantic Differential Method are used (Schütte et al., 2004).

Forth is collection and selection of product properties. Manual compilation and selection of product features from many products that available in market by the product

designer alone is the most common variant in any designing phase. Functional supports, such as fish-bone diagrams, may be helpful in complicated situations.

Fifth, investigation of Design Element. The method of examining basic design elements such as color, scale, and form of a product is known as investigation of design elements. From a customer perspective about the design concepts must be categorized into their values (Anitawati, 2009).

Sixth is analysis of Design. Most crucial in creating and maintaining a quality Kansei of product are psychological reaction to product design features. This method determines which Kansei is strongly linked to the product design elements in order to decide the design criteria for developing a product that incorporates the target Kansei. Many tools are available to do a data synthesis regarding qualitative and quantitative data. One of the tools can be used to study the data is Minitab application. By using this application, from the data collection can be analyze through linear regression, find the correlation and the standard deviation.

Lastly, model building. The collected data from the simulation can be presented as a model until the validity tests have yielded a satisfying result. Sketching part is the most crucial part as it need to draw the new product by following features have been chosen by users. In 3D modeling, it is suitable to used application Solidwork to draft. And not only one drawing it can be more than one. In previous study, there prepared six sample of drawing to be proposed by expert (Huang et al., 2011).

2.2.2 Data Collection

Usually manually data collection is most common variant for every designing process. But the most quality result for data collection have been done by the expert designer which has may experience that can decide which product that suitable by referring to the parameter will have taken out. Many ways for the designer collect data in this case is Kansei data.

Table 2.2 shows the list of data collected ways from previous study.

Bill	Topic	Data collection method
1	Improvise the design of ceramic	Data collection done by distributing
	souvenir to meet customers	questionnaires among people in public places
	desire	(Tama et al., 2015).
2	Commercial trade show booth	Using Delphi method to achieve multi-
	design for plastic and rubber	opinion in making decision as well as
	industry.	avoiding predicted error and arguments (Huang et al., 2011).
3	Systematically emotional design	Clarify Kansei image word that reflected
	method of products', it also can	emotional from user. Distribute questionnaire
	be used to design mini digital	to target users (Guo et al., 2014). The
	UNIVEgamera I TEKNIK	researcher using 5-point SD scheme.
4	A walking stick as an older	The method used is Kansei sheet, read body
	Japanese people	language and interview the old Japanese
		people (Elokla & Hirai, 2015).
5	Design for packaging design of	Kansei word were collected from books,
	powder shape freshener	journal, internet etc. then minimizing the
		Kansei word. Finally become as strategies of
		design product based on KW which is answer

 Table 2. 2
 List of data collection methods

		in first objective paper (Djatna & Kurniati,
		2015).
6	Design in innovative alarm clock	First find the respondent that agree with the
	made from bamboo	innovation. Kansei words were collected from
		25 respondent by questionnaire (Achmad
		Shergiana, 2015).
7	Developing a new jeans design	From the image sample the designer group
		and selected Kansei word from image jeans
		drawing (Nagamachi et al., 1959).
8	Designing comprehensive ball	The study collected 27 sample of ball pens
	pen	come from different companies. The 24-
	TEKN	respondent female student using 5-point SD
	LIN	scale measurement to evaluate each pen and
	**AINO	consist of 40 Kansei words (Nishino, 2010).
9	Kansei engineering approach for	The samples were collected from all type of
7	Kanser engineering approach for	The samples were concered from all type of
	consumer 's perception of the	product from different company. 8 type of
	ketchup sauce bottle	different sauce bottle with the different shape
		and function used (Mamaghani et al., 2014).

From the table above, as conclusion many ways that can be used to collect the data from respondent. There has direct interview with the respondent, questionnaire distribution and using Kansei sheet and reading body language. The method also depends on the product study. The better method nowadays is 5-points SD scheme. And distribute using google

form so can getting more respondent to ensure the data is more accurate.

2.2.3 Data Analysis Method

In systhesis data or data anlysis, the subjective or Kansei word and product design must link together. The product properties must affect the Kansei word. Nagamachi's work with Kansei Engineering over the last five years has focused on building these ties. There are a variety of quantitative tools accessible at the moment. Table 2.3 shows method tht have

been used from previous study.

Bill	Topic	Method
1	Improvise the design of	Data is processed for factor analysis and
	ceramic souvenir to meet	conjoint analysis using SPSS19.0
	customers desire	software.Factor analysis used to reduce the
		Kansei word.Conjoint analysis used to find the
	Susamo	relationship between Kansei word and the
	بل ملىسىا ملاك	design element. (Tama et al., 2015)
2	Commercial trade show	To evaluate the trade shoe design with using
	booth design for plastic	fuzzy synthetic assessment method. It conduct
	and rubber industry.	assessment of many target using many influence
		on sample (Huang et al., 2011). The evaluation
		involved 4 parts :
		1. Cluster generation (to assemble)
		2. Cluster weighting factors (design
		parameter)
		3. Aim to optimize the sample of all factors
		4. Perform fuzzy evaluation.

Table 2. 3Methodology used in previous study

3	Systematically emotional	The data is evaluated by using MDS in SPSS
	design method of	18.0 it also includes RSQ (squard correlation).
	products', it also can be	To estimate value between the computed result
	used to design mini digital	and observation data, stress value need in
	camera	smaller value. For better result, stress value
		need in lower value (Guo et al., 2014).
4	A walking stick as an	In the study of emotion, the evaluation more
	older Japanese people	referring to the user emotion through walking
		stick by Kansei sheet as well as the interviews
	MALAYSIA	revealed the emotions (Elokla & Hirai, 2015).
5	Design for packaging	Quantification theory type 1 (QTT1) is used by
	design of powder shape	Djatna and Taufik (2015) to evaluate the result.
	freshener	This method is known as quantitative and
	*Ama	categirical multiple regression analysis method.
6	Design in innovative alarm	To analyses the innovation alarm clock is used
	clock made from bamboo	Stuart Maxwell test. This test is to know the
		significant between user need and innovative
		alarm clock. As a result, customers criteria at
		5% of significant level about the innovative
		alarm clock (Achmad Shergiana, 2015).
7	Developing a new jeans	Analysis data is done by using Viramax method.
	design	This method shows that cumulative contribution
		from several factor which is from Kansei word
		(Nagamachi et al., 1959).

8	Designing comprehensive	Multiple linear regression analysis is used to
	ball pen	analyze the data from questionnaire. Ninshio
		(2010) was proposed multi-level rule extraction
		method for designing to match with Kansei goal
		and development concepts in Kansei
		Engineering.
9	Kansei engineering	In this research used statical tool Kaiser-Meyer-
	approach for consumer ' s	Olkin (KMO) measure of sample adequacy and
	perception of the ketchup	Bartlett's Test of sphericity. KMO statistic
	sauce bottle	should be 0.6 or greater. Bartlett's Test has a p-
	soft have a state	value less than 0, 0001 showing that there are
	TEKN	significant bivariate correlations between some
	A STATE	of the variables (Mamaghani et al., 2014).

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As the table 2.3 shows many methods have been used to analyze data from questionnaire. Nagamachi state that in Kansei research statistical method based on mathematical and non-

mathematical approaches have been proposed but it depends on the research context. At present, many applications can be used to analyzed data without difficulty. Minitab is a software that provide an effective way to manipulate data, getting trends and patterns, and conclude answers about current issue. Linear correlation is one of the statistical measure

techniques that define the linear of relationship between two quantitative variables. Correlation simply writes as r. The value interval between +1 and -1. If the value is 0 that

means, there no relationship.

2.2.4 Literature Study

By referring to the journal with title Development of Customer Oriented Product Design Using Kansei Engineering and Kano Model: Case Study of Ceramic Souvenir Study by Tama, Ishardita Pambudi, Azlia, Wifqi, Hardiningtyas and Dewi the main purpose conducting this research is to enhance the design of ceramic items by researching what consumers desire about ceramic items. In order to meet customer needs, in order to attract the best shoppers' interest. In this study researcher has been apply Kansei Engineering Type I -Category Classification to create ceramics for souvenir items. Following that, the significant Kansei words that influence customer happiness will become design priority for development plans. In order to collect the data, it was distributed a questionnaire with a 5point SD scale score and 20 Kansei words that represented users' emotional responses. The sample size for this research is 40 people. Respondents' personal information and reactions to each graphical sample of ceramic design were included into the questionnaire. Furthermore, this study classifies or categorises Kansei terms from customer choice into Kano Model attributes and maps them into three kinds of customer satisfaction. After that, assisted with the math calculation and statistical analysis. One of the efforts that can be taken to deal with the increasingly competition is through product design. Due to the fact that the appearance of a product is likely to be the initial impression made by buyers, its attraction cannot be separated from its appearance. The aesthetic worth or attractiveness of an item's display is strongly linked to its ability to grab the attention of potential consumers. The result shows that preferred souvenir is a drinking mug / cup with basic parabolic-shaped design, artificial exploration with 2D and textured glaze decoration, as well as coloured blocks (Tama et al., 2015).

This research with title Applying Kansei Engineering to Industrial Machinery Trade Show Booth Design was carried out to assist machinery suppliers by providing a systematic design flow chart and associated criteria for trade show booth planning. This study describes a multiple factor decision-making strategy for trade show design while looking at open days in the plastics and rubber industries. The suggested approach is divided into three sections: (1) Using the Delphi method and Kansei engineering, select acceptable assessment criteria for trade show design., (2) defining acceptable concepts and techniques for booth design for trade exhibitions in the plastics and rubber industries that use fuzzy product placement, (3) improving trade booth design to achieve trade show involvement goals. These professionals interact using the Delphi technique to create assessment criteria for booth design and elements for valuing the aims of trade show participation. Second, to develop picture word datum for describing trade show design, this study uses category categorization. These experts are expected to develop assessment criteria for trade show design, identify samples of good booth design, and verify new design cases. Data used in sample selection by experts are based on 116 sets of booths. The first three highest scores are identified as examples of good booth design. Then the most important task to survey customers preferences using Kansei Engineering. Based on this image word data, experts choose appropriate adjectives to describe trade show design. This study applied the fuzzy synthetic evaluation approach. For the advance assessment, 30 interviewees that divided into two groups including 15 members with mechanical engineering experience and other 15 members with product design experience. These two groups have significance in order to design booth. To summaries the analysis of six samples by 30 interviewees it states that the attributes in designing trade booth are 'very modern', 'simple', 'professional' and 'scientific'; those describing lighting include 'very bright'; and those describing functionality include 'practical', 'convenient', 'comfortable', and 'clean' (Huang et al., 2011).

Emotional Design Method of Product Presented in Multi-Dimensional Variables Based on Kansei Engineering, this journal study presents a Kansei Engineering based systematically emotionally design process for product hard interactions, which may be developed to generate a product that mirrors customers' feelings. Therefore, it is of high necessity to study users' emotional needs aroused by the product's multi-dimensional design variables. The KE models are built using typical paired Kansei image words and multidimensional key design factors acquired using consumer-oriented methodologies. It may be utilised in a variety of design situations to improve the emotional design of a product. The key in technologies and methods of product design, which included Kansei images, describing the product form, identifying form design variables, establishing relationships between Kansei images and the design variables, and developing the product intelligent design. The request study of the target user for the study item is the first step in the KE-based product design. This phase requires collecting as many samples of the research object as possible, and then determining many with various appearance features that may be applied in the next phase after objectives are clearly by a target population. Secondly, certain important Kansei image words are selected out based on the three which was before criteria and the frequency in which users use the words to assess the study item. Third, a questionnaire experiment is used to determine how similar they are. Following the assessment, an averaged comparable matrix was obtained, which MDS in SPSS 18.0 could process RSQ (squared correlation) values in various dimensions. So, the result in this paper is a new mini digital camera have been chosen by decode the binary code. In this paper, there were two disadvantages. First, the research participants were a select group of undergraduates ranging in age from 20 to 32. Secondly, occupation, race, area, and other variables may all have a significant impact on the outcome (Guo et al., 2014).

Evaluation of Assistive Mobility Product for The Japanese Elderly by The Kansei Sheets by Elokla, Nermin, Hirai, Yasuyuki this study applied emotions design methodologies to evaluate the Kansei demands of the Japanese elderly for individual helper items linked to movement. The current design of a walking stick was reviewed from the perspective of elderly individuals in this investigation. The above research was carried out using two different emotional evaluation methods are Kansei sheets and read body language (RBL) sheets. Several issues with the design of walking sticks were found in this study. It emphasized on the current design of the walking stick and its issues as can be seen by users. To assess users' emotions and highlight the most significant design concerns, three emotional assessment methodologies were applied. Kansei sheets, read body language (RBL) sheets, and interviews are some of the methods used. Two sheets represent approximately a Kansei sheet. The first sheet has 14 different emotional reactions. Sheet #2 has nine physical sensations. Sheets #1 and #2 are used to analyze and assess consumers' interior emotional experiences and conscious bodily responses following product/service contact. The user can choose the image/s that best represent his or her emotional state to a product from the two sheets. The user's emotional and bodily responses are measured using a Likert-type scale on the Kansei sheets. Each level of stick design assessments required subjects to apply kansei sheets. The final question was the overall judgement of stick design (reflective level). The following are the example of evaluating questions for stick designs. Stick appearance/aesthetic evaluation -visceral level (using Kansei sheet # 1): Q.1 What do you feel about handle form? Q.2 What do you feel about foot design form? Stick usability and overall evaluation -behavioural level (using Kansei sheets # 1 and 2): Q.6 What do you think about the usability of the stick handle from ergonomics aspect? The findings of both Kansei sheet #1 and the interviews suggested that the subject feelings were mostly favourable when it came to the stick look. Their feelings were divided into two categories: satisfaction and attraction. Three factors, according to the research, might be to reason for the variances. The first possibility is that an observer may fail to see a certain sort of user facial expression known as a "micro-expression." Second, the "universal language of emotion" has been labelled facial expressions. Third, the physical signal theory proposes that two channels trigger physical reactions: emotion, which may alter in the body and is projected to the brain, and cognitive, which represents emotion and may be engaged in the brain without being directly prompted by a physiological reaction. At total the design that need in walking stick are unique soft handle, height adjusting stick, small size for storage, light weight material and attractive elegant design (Elokla & Hirai, 2015).

A journal with title A System Analysis and Design for Packaging Design of Powder Shaped Fresheners Based on Kansei Engineering written by Elokla, Nermin, Hirai, Yasuyuki. The primary goal of this study is to satisfy client preferences and increase sales of tea powder products by creating beautiful packaging by using Kansei Engineering. Kansei Engineering contributed to the development of a new developed product by connecting the required product attributes for customer satisfaction. That is a chance to improve the look of packaging concept and package quality, which will therefore lead to enhanced customer demand, enjoyment, and satisfaction. Packaging design may be stated to have a key influence in influencing a consumer's choice to buy a product. To be capable of influencing a consumer's decision, a package design that is both interesting and unique was necessary. The research's key objective was to determine the design element of package design, to recognize packaging design on Kansei words, and to develop a new packaging design. With analysis and design, the production system that can improve the efficiency and effectiveness in the system especially in order to produce the packaging design of tea powder by using the Kansei engineering method was produced. In methodology, process system development is the first stage of the system approach's evaluation. Throughout this step, the goal is to specify factors in the analytic system in terms of the overall user. Utilizing tools like Sybase Power Designer 16.0, analyse and model business processes using BPMN workflow. The research used BPMn to analyse processes and subprocesses in order to derive an overall process flow. The second step in methodology is element identification. In starting to develop a product design is to identify the product design. In this research, we determine the design of a tea powder item in terms of understanding its design features by collecting tea powder product samples. Then third step is identified product element on Kansei word where it can derive from books, internet, journal etc. Next, the evaluation's results were combined applying the quantification theory type 1 (QTT1) approach. The QTT1 may be thought of as a quantitative and category multiple regression analysis approach that allows for the inclusion of categorical and qualitative independent variables. As a result, bright, modern, straightforward, and eyecatching are the four main categories of tea powder package design on Kansei words (Elokla & Hirai, 2015).

By referring to the journal with title Design of Innovative Alarm Clock Made from Bamboo with Kansei Engineering Approach by Achmad Shergian and Taufiq Immawan. The innovation of alarm clock that made from bamboo as the source of sound is the one alternative solution of a declining both products. However, due to the impact of the modern toy development, the traditional toys were declined. Othok-othok toys and alarm clock currently are in the declining phase of sales. As a result, the bamboo alarm clock was developed as an alternative to the declining both items. There are different approaches for designing a product, but Kansei Engineering was employed in this study because it can particularly excavate sentiments from customers, resulting in goods that represent sentiments customers. The questionnaire was divided into three sections: Kansei word identification, physical design specification, and physical design parameter evaluation. These important Kansei should be selected as design specifications in the final design. The survey was performed to find Kansei words until a total of 25 people agreed with the idea. The questionnaire consists of three sections: Kansei word identification, physical design specification, and physical design parameter validation. According to the majority of responses, the chosen object best represents traditional design (traditional, creative, unique, and natural). The revolutionary alarm clock was put to the Stuart Maxwell test of marginal homogeneity. The goal of this experiment was to see if there are any major variations between user needs and innovative alarm clocks. As a conclusion in this research paper state that at a 5% significant level, the design unique alarm clock was valid to fulfil consumer criteria. Traditional design and exquisite design were the two elements that split client choices (Achmad Shergiana, 2015)

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Next journal titled Kansei Engineering Approach for Consumer's Perception of The Ketchup Sauce Bottle. Same as another research that used Kansei Engineering the method is same. But the number of respondent and Kansei word only different. There were 31 Kansei words chosen, as well as eight distinct types of sauce bottles with various forms and functions. All of the studies took place in Tehran, and 47 persons were included in the study, with 23 men and 24 women varying ages from 20 to 50. To determine the relationships between product attributes and adjectives, a 5-point semantic differential scale was used. These product samples belonged to seven different food products companies. The data in this research were analysed using SPSS software by multivariate statistical techniques such as factor analysis. As generally, the average Kansei answers for each sample have a welldefined distribution. Quality and statistical tools must be integrated with Kansei engineering. The advantage of factor analysis is that all of the variables included play the same function. It is feasible to group replies with similar meaning using a factor analysis on the replies gathered on a certain questionnaire. This cuts down on the number of indicators needed to describe all the replies. At total, the findings show that five elements shape ketchup sauce container samples: visual, personality, operational, distinctive, and fragile (Mamaghani et al., 2014).

The study conducted by Djatna, Taufik, Wrasiati, Luh Putu, Santosa, Ida Bagus Dharma Yoga with title Balinese Aromatherapy Product Development Based on Kansei Engineering and Customer Personality Type. This product is distinctive and well-known in the market because to the blend of aromatherapy and Balinese culture. To produce a new design idea for a Balinese aromatherapy treatment product, three objectives of this study were offered first is to generate the new design concept of Balinese aromatherapy product using Principal Component Analysis (PCA), second to identify the relevant product design element using Relief method, and lastly to generate the quantification model of aromatherapy product design using Fuzzy Quantification Theory Type 1 (FQTT1). From twelve design aspects selected, 10 suitable design components were developed using the Relief approach. Design support data has been developed from these models to help product designers in making decisions for the new Balinese product design. Kansei Engineering (KE) was selected to synthesis these factors in order to develop Balinese aromatherapy product design in this study. Kansei Words are keywords that indicate a customer's perception, sensation, or picture of a Balinese aromatherapy product in this study. Furthermore, depending on the customer's personality type, recommendations for design element combination and arrangement were made. In this research, three interviewing specialists resulting in a total of twelve Kansei words, which were used to describe a Balinese aromatherapy product. The words were then rated on a Likert scale (7 scale) by 30 customers of the product. The Principal Components Analysis (PCA) approach was used to examine the assessment results. The study used Balinese aromatherapy massage oil to show how Kansei Engineering and FQTT1 analysis were used to aid product designers in creating new product design decisions for each personality type. The extraction of KW obtained using the PCA approach reduced 12 Kansei words to one word, which reflected a new design concept. In summary, the findings revealed that all design specifications for Balinese aromatic products were unique to each personality, with the majority of them proving to be effective as new design standards. A larger degree of worldwide demand may be envisaged if the product development of Bal Indonesian aromatherapy is more closely linked to consumer personality type (Djatna et al., 2015).

Kansei Robotics: Bridging Human Beings and Electronic Gadgets Through Kansei Engineering written by Kato, Toshikazu. Such an information environment would provide modest and human friendly manner for users including elderly people. Data assistance services, such as suggestion services, are mostly based on social suggestion, which is based on collaborative filtering of a large number of consumers buying records, which does not account for variances in personal preference. Through subconscious contact with a centralized data environment, this work proposes the notion of Kansei mechanism and its modelling approach through unconscious interaction with electronic gadgets. We can model these relationships by statistical behaviour log analysis. Our basic ideas are one is to find users interested and /or preferred items through observation on his behaviours in present everywhere information environment. Secondly, to automatically build his preference model. Lastly, to apply the model to provide suitable information service in the real world. As mentioned above this paper used Kansei modelling to running the experiment. There have three step which is one, Estimation dominant attributes by adopted conjoint analysis as to find the dominant attributes. All those products were analysed with statistically quantification method. Second, method of recommendation considering dominant attributes. When a consumer stands in front of a digital signage unit, the Smart Shop makes product recommendations based on their preferences. They are suggested by a high-scoring order. Lastly, method of recommendation considering dominant attribute. An experiment ran to compare our implicit Smart Shop approach to the old explicit questionnaire technique. Four male students served as subjects. With five phases, the participant assessed his preference for the five recommended goods. This suggestion phase was done three times, yielding a total of 15 product assessments. Respondent given the questionnaire and needed to evaluate the product base on two answer which is 'like' or 'dislike'. And at last, these findings showed that Smart Shop has achieved implicit estimate of prominent qualities using our technique. Finally, these findings showed that Smart Shop achieved implicit assessment of dominating qualities in three of four respondents using our technique. These also shown

that, in the event of predicted dominating qualities by Smart Shop and another by survey that did not fit, modelling by questionnaire satisfied a subject better (Kato, 2013).

In 2010 the study conducted by Nishino Tatsuo titled Kansei Engineering Design of Comprehensive Ball Pen Based on Rough Set Analysis, the researcher discovered consumers' wants, developmental concepts, and design qualities using the suggested hierarchical rough set technique. Therefore, we discovered a variety of appealing design options. As a result of applying three separate decision rule evaluation measures, we discovered many appealing design aspects. Three type of decision rule set are S-S-S (supportive design), E-E-E (unique design) and C-C-C (strong design) Researcher discovered consumers' desires as well as developing concepts and design qualities to actualize customers' desires applying the proposed hierarchical rough set approach. Next, there are 24 female students participated in a Kansei assessment experiment in which they assessed 27 various ball pens using 40 Kansei Word and 5-points SD parameters, including consumer desire and 'attractiveness.' The rough set model proposed in this study is used to derive decision rules for Kansei product design throughout this section. A researcher offers a technique for extracting multi-level decision rules. The technique seeks to connect unspoken client desires, development concepts and design features. The following is the technique for extracting decisions. Step 1 detects principal combinations axis of the component. The derived evaluation criteria might be interpreted as a customer's desire for product development. Step 2 looks for Kansei word combinations. The evaluation criteria that were obtained might be viewed as alternative development approaches for meeting client needs. Step 3 is to identifies design combinations. The extracted decision rules may be thought of as design qualities that help developers meet their goals. Lastly, we may get design specifications to better fulfil objective Kansei through three steps. As a result, there have three final concepts for the design attributes which are S-S-S for common decision rule set is advance design, E-E-E represent unique decision rule set is advance and young, and finally C-C-C represent strong decision rule set the design is advance, young and simple (Nishino, 2010).

In year 2013 a journal named Kansei Engineering for e-commerce Sunglasses Selection in Malaysia by Chuan, Ngip Khean, Sivaji, Ashok Shahimin, Mizhanim Mohamad Saad, and Nursyakinah. Based on restricted physical visual design, researcher utilize a methodical application of Kansei engineering to uncover the design aspect that may provide emotional appeal for e-commerce consumers. 30 Kansei word relating to the sunglasses advert descriptions were investigated utilizing multivariate statistical analysis employing the Kansei engineering type I technique with twenty sample products (specimens). The key Kansei Words were identified using Factor Analysis (FA) and Principal Component Analysis (PCA), while Partial Least Square (PLS) analysis was used to find the key design features that correspond to the chosen Kansei words. To perform the evaluating test using the URANUS system to establish a survey website and 75 people (aged 18 to 34) requested to rate Kansei words appeal on a 5-point SD scale for each of our twenty samples. Analysis begins by using Factor Analysis to identify a limited number of elements that will carry a significant amount of weight. The study data were transferred to Principal Component Analysis, and the association between Kansei words and specimens is discovered. PCA's overall contribution is nearly identical to the results of our Factor Analysis. The appropriate Kansei phrases that might express the emotional appeal of our target consumers are selected at this step of Kansei Engineering. The influential design features are determined using Partial Least Square (PLS) Analysis. The Product Classification and data from the Kansei words survey are used to create PLS. A connection is established between the four Kansei words chosen, and the design feature described in the product. The final design element list has two color scheme and the color for the frame are blue, orange or yellow. The feature for frame is either half or thin frame.



2.2.5 Summary of Literature Review

No.	Year	Author	Title	Method	Data analysis	Product
1	2015	Tama,	Development of	Getting customer	Mapping result statistic in	Souvenir – Ceramic
		Ishardita	Customer Oriented	opinions by answering	Kano model by using	drinking mug
		Pambudi	Product Design using	questionnaire without	SPSS 19.0 software	Feature: basic parabolic-
		Azlia, Wifqi 📑	Kansei Engineering and	limitation	Conjoint analysis –	shaped design, artificial
		Hardiningtyas,	Kano Model: Case Study		determined relationship	exploration with 2D and
		dewi 🦰	of Ceramic Souvenir		between Kansei word and	textured glaze decoration, as
		F			design element.	well as colored
						blocks.
2	2011	Huang, Ming	Applying Kansei	Interview 15 person	Using fuzzy composite	The perfect trade show
		Shyan	engineering to industrial	with mechanical	evaluation.	booth is described as
		Tsai, Hung	machinery trade show	experience and 15 with	· · · · · ·	"scientific," "modern,"
		Cheng	booth design	product design		"bright," "clean,"
		Huang, Tzu		experience	· G. V	"practical," and "pleasant,"
		Hua		Answer 3 survey.	**	all of which are fundamental
		U	VIVERSITI TER	KNIKAL MAL	AYSIA MELAK	elements in new case design.
3	2014	Guo, Fu	Emotional design method	Distribute 3	MDS in SPSS 18.0 it also	Getting the highest score for
		Liu, Wei Lin	of product presented in	questionnaire for	include RSQ(squard	mini digital camera
		Liu, Fan Tao	multi-dimensional	choosing camera	correlation	
		Wang, Huan	variables based on Kansei	product.		
		Wang, Tian Bo	Engineering			

Table 2. 4Summary of literature review.

4	2015	Elokla,	Evaluation of Assistive	Kansei sheet method.	Result evaluated from	Walking stick feature:
		Nermin	Mobility Product for the	Interview and read body	interview and result of	Soft handle.
		Hirai,	Japanese Elderly by the	language		Adjusting height.
		Yasuyuki	Kansei Sheets			Light weight material
5	2015	Djatna, Taufik	A System Analysis and	Collect Kansei word	Using Quantification	Tea powder packaging:
		Kurniati,	Design for Packaging	from books, journal and	theory type 1 (QTT1)	Bright, modern, simple, and
		Wenny Dwi	Design of Powder Shaped	internet.		eye catching.
			Fresheners Based on	Distribute questionnaire		
		11	Kansei Engineering			
6	2015	Achmad	Design of Innovative	Received agreement	Using Stuart Maxwell test	Alarm clock feature:
		Shergian, 💾	Alarm Clock Made from	from 25 respondents		Traditional design (which
		Taufiq	Bamboo with Kansei	who agree with		consist of traditional,
		Immawan	Engineering Approach	innovation		creative, unique and natural)
			8a			and Elegant design (which
			Alko			consist of clear, exclusive,
			1			artistic, and interesting)
7	2014	Mamaghani, 🖌	Kansei Engineering	47 respondents answer	Kaiser-Meyer-Olkin	ketchup sauce bottle feature:
		Nasser Koleini	Approach for Consumer '	the question base on	(KMO)	aesthetic, personality,
		Rahimian,	s Perception of the	feeling with actual	measure of sample	operational, unique and
		Elnaz	Ketchup Sauce Bottle	product.	adequacy and Bartlett's	brittle.
		Mortezaei, 🤳	VIVERSITI TER	(NIKAL MAL	Test of sphericity has	A
		Seyed-reza			been used	
8	2015	Djatna, Taufik	Balinese Aromatherapy	12 Kansei word are	Principal Component	The development of Bal
		Wrasiati, Luh	Product Development	getting from	Analysis (PCA), Fuzzy	Indonesian aromatherapy is
		Putu	Based on Kansei	interviewing three	Quantification Theory	
			Engineering and	expert of aromatherapy.	Type 1 (FQTT1).	

		Santosa, Ida	Customer Personality	30 customers involve as		more closely linked to
		Bagus Dharma	Туре	respondents by		consumer personality type.
		Yoga		answering		
				questionnaire.		
9	2013	Kato,	Kansei robotics: Bridging	The subject is 4 male	statistically quantification	These findings showed that
		Toshikazu	human beings and	students with 5 phases	method.	Smart Shop achieved
			electronic gadgets	in 1 evaluation by		implicit assessment of
			through kansei	preferred 5 items in 3		dominating qualities.(3/4)
		10	engineering	times repeated		
		K	3	evaluation using		
		E	•	questionnaire.		
10	2010	Nishino,	Kansei Engineering	Respondent 24 female	Multiple linear regression	Three final concepts for the
		Tatsuo	Design of Comprehensive	students. 27 vary ball	analysis	design attributes:
			Ball Pen Based on Rough	pens. 40 Kansei Word.		
			Set Analysis	It is using 5-points SD		S-S-S - advance design,
				parameters in		E-E-E - advance and young,
		5	M	questionnaire.		
		_	man and	- in t	موم منتح ، م	C-C-C - advance, young and
				**		simple.
11	2013	Chuan, Ngip	Kansei Engineering for e-	75 respondents (aged	Factor Analysis (FA) and	Two color schemes, The
		Khean	commerce Sunglasses	18- 34). 30 Kansei	Principal Component	color frame: blue, orange or yellow. Frame: half or thin
		Sivaji, Ashok Shahimin,	Selection in Malaysia	word.	Analysis (PCA), while	frame.
		Mizhanim		20 samples of products.	Partial Least Square	name.
		Mohamad			(PLS) analysis.	
		Saad,				
		Nursyakinah				

CHAPTER 3

METHODOLOGY

3.1 Introduction

The method in this research work is design to attain the three research objectives. Air freshener has been chosen as a product domain to develop the prototype. In this research paper, three different phase method is followed by the objective. The first phase is study, second phase is analyzing, and the last phase is design. In addition, the research framework and method are representing in Figure 3.1. To ensure the research is accomplish the objective, framework was design in parallel from the initial study about Kansei Engineering, problem statement, objective of the research, methodology, data collection, data analysis, product design, discussion, and conclusion.

The thesis started with the selection of a product domain as the study's topic. Phase 1 is about research study on Kansei Engineering related to product design. This phase is related to the first objective which is to study the Kansei Engineering applied in product design industry. In phase 2, the methodology used is collected data from respondent about how they are felling about the air freshener by looking at it. Furthermore, data analysis is done

Moreover, this phase methodology is to achieve the second objective which is to collect data and evaluate result from Kansei Engineering questionnaire. Last phase is phase 3, the procedure is more on designing the new design for the air freshener and get respond from

using Minitab application to find the correlation in creating new design for a product.

consumer about the last design. At total, the main idea in this methodology is about planning how to complete this thesis by phase. The work project flow shows in Figure 3.1.

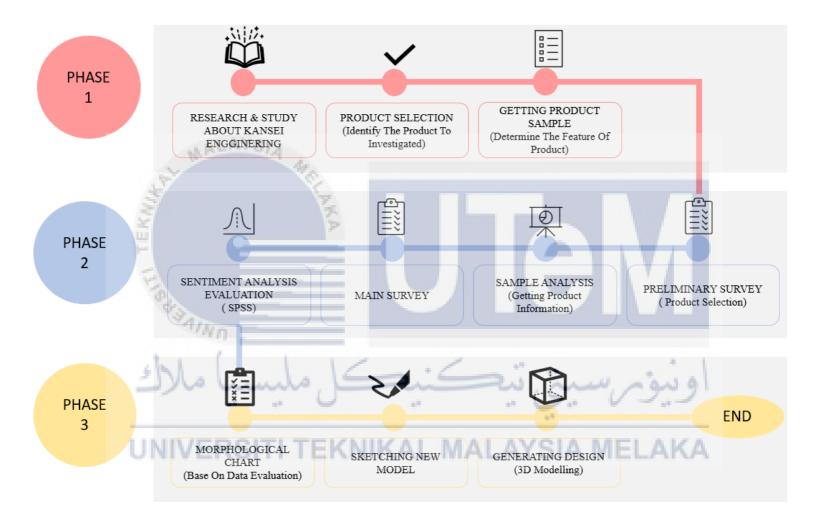


Figure 3.1 Full research framework.

3.2 Phase 1: Understanding Kansei Engineering

In this step is about doing research about Kansei engineering that related to improvising a product design development. The design improvement in Kansei engineering is related with consumer feeling. The first step is identification the main product as the research

object. The summary for first phase is presented in Figure 3.2 below.



Figure 3.2 Framework phase 1

3.2.1 Study on Product Design Development

Afterward, the sample for product domain was collected by internet searching and online shopping website. Moreover, the Kansei word were collected from advertisement through electronic device and customer reviews expressing their sentiment about air freshener from internet as well as social media. There have several types of air fresheners available in market Subsequently, the collected samples were sorted by the type of air freshener which is research only take the automatic air freshener. From this point, the element of the product was classified by component. It is easy to respondent to respond in survey.

3.2.2 Product Design Shortlist

Main product is the product that have been chosen to develop the new design concept by using Kansei engineering approach. For this research air freshener have been chosen as main product. 37 air fresheners have been shortlisted by doing further research about air freshener that available in market. The research is done with internet research method and observation. The research method is done by searching the shopping website as well as some review blog. While observation method done at hypermarket in house scent section. All twelve sample of air freshener then will be listed in Kansei first questionnaire to let consumer pick the most attractive.

3.2.3 Collecting Kansei Word

Kansei word is the word that can illustrate the consumers feeling and demand. Kansei word is collected which related to the air fresheners. Usually, Kansei word are adjective or a sentence that related to the feeling about the main product. This Kansei word will used in second survey. Seventeen Kansei word was collected from internet journal and review for online shopping website. In Table 3.1 shows Kansei word for air freshener casing that will be used in this research purpose.

Elegant	Beautiful	Old Fashion	Multicolour	Attractive	Bright
Trendy UN	VERSIT	Dual Colour	L MALAYSIA	Ordinary	Simple
Eye Catching	Plain	Modern	Easy Handling	Unique	

Table 3.1 Kansei word for air freshener's casing.

3.3 Phase 2: Analyzing Data

In phase 2 to achieve second aim which is data analyzing based on Kansei survey. First thing needs to collect data from user is construct the first questionnaire as known as product selection survey. The questionnaire number one is mostly about getting data of customers choosing the various design of product that available in market and collecting the general information about respondent. It is about twelve design that available in first questionnaire. Figure below is the flow cart for framework in second phase in this research.

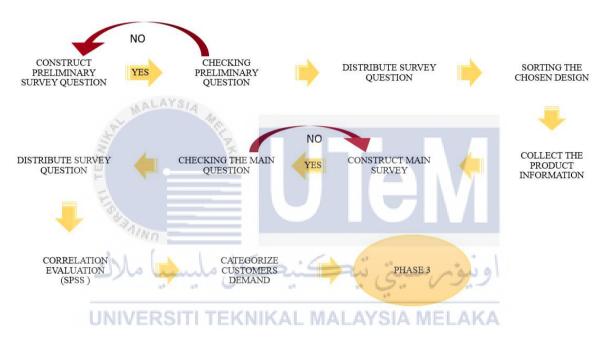


Figure 3. 3 Framework for Data Analyzing Phase.

3.3.1 Kansei survey

Kansei survey is an analytical assessment of consumers' thoughts and opinion on a variety of product samples in the form of a questionnaire that have results from the data set. The main purpose for first questionnaire is to get the data about which design of air freshener that consumer prefer to buy. There only have 2 survey that needed to get the data set for Kansei engineering product development improvement.

3.3.1.1 Preliminary Survey

Meanwhile, the first section in the survey was asking about respondents' general information such as age and gender. Next, for the second section the question was about selection of product that related to domain product which is available in market. There have about 37 type of air freshener design that have been selected. In this section also asking about the shape that more users prefer as well as the color more preferred. The color that has been listed is related to the interior design color that suitable for home decoration. There has some feature that may affect the emotion of users such as the pattern on the casing for spray can, the size for spray hole and the way users prefer to place. Figure below represent example for questionnaire.

3.3.1.2 Data Distribution

The survey was construct using Google Form. By using social media application like Facebook, and WhatsApp as a medium to blast both questionnaires to get attention from uses as respondent. For this study there have no target respondent. This method is applied for all survey in this research paper.

3.3.1.3 Main Survey

The result from the first survey, is a guideline that help to construct second survey question. As for second survey, product that only got highest score for product from first survey is chosen for a further question. In this survey, the question is more focused about the chosen product and more detail feature such as the appearance and feature. Moreover, using the Kansei word let the respondents choose points on each Kansei word of the number of the existing scale with expectation of respondent to the product. Same as in survey number one, firstly construct the question that related to feature that included Kansei word which is the adjective and judgement of the product.

3.3.2 Kano ModeERSITI TEKNIKAL MALAYSIA MELAKA

The Kano Model is a technique for analyzing and measuring consumer demands. It's a method of identifying clients' basic demands, as well as performance and excitement requirements. Therefore, if you include a virtual assistant option, you will increase client happiness and set yourself apart from competition.

In Kano Model product analysis have been classified in to five categories of quality elements by depending on customers satisfaction and customers requirement.

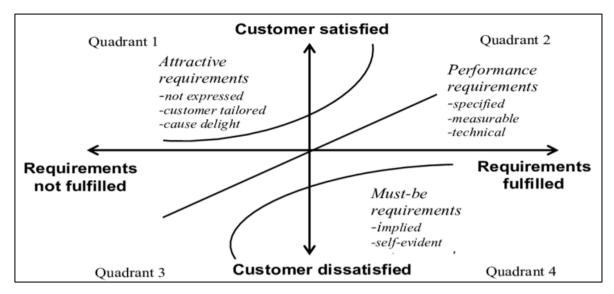


Figure 3.4 Kano Model (Rotar & Kozar, 2017).

1) Attractive quality elements

They bring satisfaction, but when they are not provided, they do not produce frustration because customers do not expect them. An increase in satisfaction leads to an increase in satisfaction, which is not the same as an increase in fulfillment.

2) One-dimensional quality elements

If quality elements are met, they result in happiness; when they are not met, they lead UNIVERSITITEKNIKAL MALAYSIA MELAKA to dissatisfaction. A rising in fulfilment leads to a potential increase in satisfaction, whereas a loss in fulfilment leads to an equal reduction in satisfaction.

3) Must-be quality elements

Whenever quality elements are not met, the user is dissatisfied since they are accepted as fact. However, when they are met, they don't really lead to satisfaction. A decline in fulfilment leads to an increase in discontent that is unequal to the decrease in fulfilment.

4) Indifferent quality elements

Qualities aspects that result in neither satisfaction nor discontent, whether satisfied or unsatisfied

5) Reverse quality elements

Quality characteristics that cause frustration when met and satisfaction when it's not met

Other than that, The SI (positive CS-coefficient) varies from 0 to 1. The closer the value is to one, the higher the impact of achieving the criteria on customer satisfaction; meanwhile, the closer the value is to zero, the less influence. Furthermore, the negative CS-coefficient (DI) varies from 0 to -1. This approach is used to determine the influence of the kano element on functioning, whether it is greater or lower.

3.3.3 Data Analysis (SPSS)

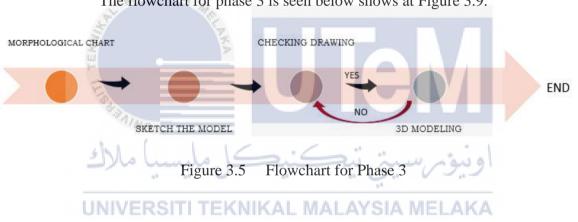
A statistical package for social science is a tool made for quantitative researches have several type of data that can be analyzed by using SPSS software such as nominal data, ordinal data, interval data and ratio data (Garth, 2008). SPSS provides many statistical analysis data such as regression, ANNOVA, quality tools and time series. It can be used to explain the data and make inferences by presenting data using graph. With this way it easy to visualize the data and validate. In main survey, it required to come out with relationships between two variables.

i. Pearson's Correlation

It is very popular statistical analysis compared to other, often used and very useful. Correlation analysis is a standard approach for determining the importance of a bivariate relationship between two variables in this study. Pearson's Correlation analysis is typically performed when the requirements of this test are met (Ong & Puteh, 2017). That quantifies the link between two variables is correlation coefficient, r. As r approaches +1 (Hanushek & Jackson, 2013), an experiment with a high value for one variable is likely to have higher value for the other.

3.4 **Phase 3: Product Design Development**

In this research report, phase 3 is the final phase. The design and development process will be the main focus of this step, with the target customer defined, applicable product in the market defined, and selection concept for product design according to specifications required. This is the most crucial stage since it determines the project's overall outcome.



The flowchart for phase 3 is seen below shows at Figure 3.9.

3.4.1 Pugh Method

Stuart Pugh devised the decision-matrix approach, often known as the Pugh method or Pugh idea selection. It is a qualitative methodology used to rank the multidimensional alternatives in an option set. The Pugh matrix is a mechanism for choosing the most practical approach from all provided possibilities. This is a critical tool used in the product development process to ensure that the proper concept is adopted throughout the concept selection process. There have two step to follow which are select the datum and ranking and assessment (Joshi et al., 2019).

Concept	Relience- Jio	Idea	Vodafone	BSNL	AIRTL
Criteria					
Network	+	+	10 11 11	+	
Datapack	++	+	+	-	-
Talk Time	++	++	++	+	+
Validity	+++	++	+		+
Costing	++	++	+	656	3 7 0
	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	∑+ signs+∑- signs
	10	8	4	-1	-1

Figure 3. 6 Illustration of Pugh method.

2.3.2 Concept Development: Morphological Chart

The first step in this process is to create a concept using morphological chart analysis. A morphological chart is a table that list all the related product features and discusses various ways as well as variation for achieving them. Through constructing single function from different function, solutions could be displayed in a chart and used as a tool for analyzing alternative solution. That stimulates the development of various combinations of solutions and ideas by using specific mechanisms by each purpose of each principle. The functions can be seen on the left side column of the table in a morphological chart, while different ideas that can be used to carry out the functions mentioned are displayed on the right.

After constructing morphological chart, the combination of idea will be created variation of new concept design to narrow down the scope. A design concept is a product improvement or innovation that improves or innovates the product's appearance, usage, and mechanical physical operation. The development of concept then sketching several drawings to visualize the product.

2.3.3 Sketching Drawing

Sketching drawing is the first step before draw the actual drawing in 3D model. By combining the concept from morphological chart, should have picture for every of it. List all the new development concept drawing. The drawing is only using normal paper. From the morphological chart, 3 concepts of design that can be present in next step.

2.3.4 3D Modelling Drawing

A 3D model is created a design, from the sketch that have been chosen from morphological chart regarding product design product. The selected sketching drawing will proceed with the detail measurement in 3D CAD modelling, and documented detail layout or drawing in Solidworks software.

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CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter covers several subjects. In this chapter, the project's outcomes will be displayed and presented. The outcomes of user preferences regarding product feature and physiognomic parameters have been gathered to identify which product received the most votes from the respondents. There have two data need to be analyzed which is related to new Kansei Engineering product development as well as Kano model method. The purpose of the survey is to gather information about consumer needs based on the functional and dysfunctional aspects of air freshener's casing. The questionnaires were then distributed to the target respondents. All the surveys are using application google form and distributed through social media. The semantic differential (SD) method is used in design development to analyses consumer requirements. To evaluate the psychological worth of product, SD is the most commonly used measuring tool in customer design methods. SD has been used in Kansei Engineering to identify the relationship between emotional responses and products in the design of air freshener casing. The data analysis information needed was analyzed and manipulated using several tools like Statistical Package of Sciences software (SPSS v.25) and Excel to describe the statistical information required correlation between the respondent's emotional word represented by Kansei word versus air freshener function and dysfunction expressed through customer satisfaction of the Kano method.

4.2 Sample Size

The purpose selection survey is to get the number of responses from the user about the 35 different designs of air freshener that are available in the market. The survey contents have three sections which are first is the general information section, second is about the product background, and lastly is about product selection. There are 62 respondents who answered the survey that has been spread at random through social media. They answered the survey by selecting which product's shape, color, and pattern make them feel more attractive to

choose.

4.3 Developing Questionnaire

The questionnaire was designed in two surveys which are first to minimize the design as well as the Kansei word that have been collected. The second survey's main objective is to collect data about customer satisfaction regarding the design and the function towards the product attribute which is air freshener casing. Both surveys contain three sections labeled Section A, Section B, and Section C. In the first survey, Section A is about demography question then followed by Section B which product background and lastly Section C is asked regarding the election of Kansei word as well as an election about the existing product design. Meanwhile, for the second survey, the respondents need to answer the survey way more detail which contains three sections as well. Section A same as the first survey which is demography, Section B is about product attributes which the question is more about design selection, then Section C is about the Kano model question which asked about functional and dysfunctional regarding the air freshener.

4.4 **Preliminary Survey**

The preliminary test is essential since constructing the ideal survey questionnaire is difficult. In order to decide the efficient survey questionnaire, it is required to pre-test it

before conducting the main survey. The purpose of this survey is to eliminate the unrequired information to minimize the information before proceeding to the main survey. Before distributing the pre-survey, the question has been checked by the expert lecturer to ensure that there does not have no mistake regarding the formatting, language, as well as

the other typological error or issues. The survey, which was distributed at random via social media, received 70 responses. Based on Kansei Engineering, the preliminary survey focuses on the consumers' backgrounds in comparison to product design aspects connected to emotional or affective design. The first survey includes the respondent's information, Kansei's words, and three different meanings that based on Oxford, Longman, and Webster Merriam. About 17 Kansei's words were used in the preliminary test. The purpose of this survey is to collect information on which Kansei words were picked by respondents based on their emotions, as well as the expression of their choice for the air freshener case design

4.4.1 Demography Evaluation

For the first section question, respondents were asked about their personal information such as gender, age, and the status of residence. The figures below depict the data obtained for the general information section.

According to Table 4.1, there were 34 men and 36 women among the responders. Figure 4.1 illustrated the pie conversation based on the gender data collected from the respondents. There are 49 percent male respondents and 51 percent female responders among the 70 participants who responded to this survey.

Table 4.1Number of respondents by Gander

Gander	Frequency
Female	36
Male	34
Total	70

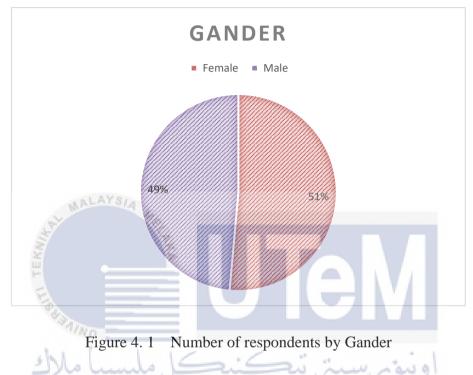


Table 4.2 illustrates the age range of those who answered to the survey. There are four age groups to choose from: 18-30, 31-40, 41-50, and 51 and above. The bar chart in figure 4.2 clearly indicates that the age range of 18 - 30 years old has the highest number of participants, with 37 respondents. Meanwhile, the age groups 31-40, 41-50, and 51 and above had the same number of responders, which is 11.

Group of age	Frequency
18-30	37
31-40	11
41-50	11
51 AND ABOVE	11
Total	70

Table 4. 2Number of respondents by Age

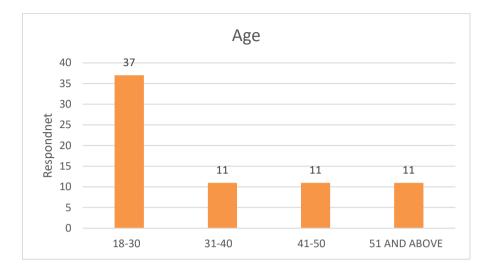


Figure 4. 2 Number of respondents by Age

The next part of questionnaire is about respondents' residential status, which is divided into three categories: live alone, live with family, and live with roommate. The number of participants based on their resident status is shown in table 4.3 and graphic 4.3. According to the pie chart, the majority of respondents (59 percent or 41 people) live with their families. Meanwhile, the proportions of respondents who live alone and those who live with a roommate are not significantly different, at 14 (20%) and 15 (21%), respectively.

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Table 4. 3	Number of	respondents	by I	Residence Status
------------	-----------	-------------	------	------------------

Residence	Frequency
Live alone	14
Live with family	41
Live with roommate	15
Total	70

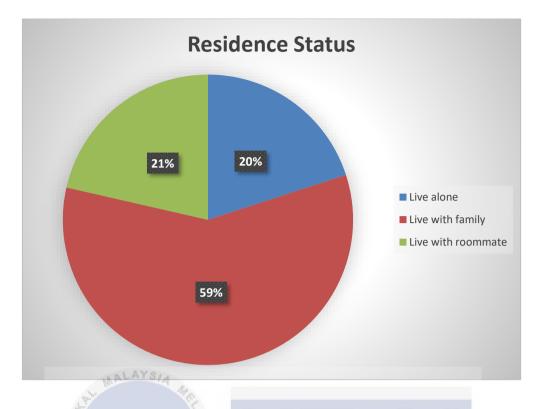


Figure 4.3 Number of respondents by Residence Status

4.4.2 Product Background Evaluation

The questions in the second part are related product attributes based on the respondents' opinions. The purpose of this part is to gather opinions and preferences while determining whether or not to purchase an air freshener.

The presence of air freshener in the respondent's home is shown in table 4.4 and a pie chart in figure 4.4. There are three response groups: 0-1, 2-3, and 3 and above. About 44% or 31 out of 70 respondents does not have or having only 1 air freshener in their residence. Nevertheless, about 22 (32%) participants having two to three air fresheners in their home. Finally, there are also respondents who are having 3 and above air fresheners in their home.

Amount of air freshener	Frequency
0-1	31
2-3	22
3 and above	17
Total	70

Table 4. 4Number of respondents according to the number of air fresheners available in
the house.

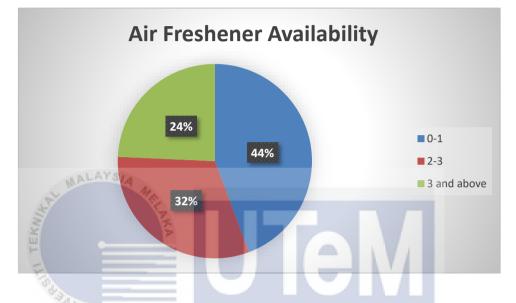


Figure 4. 4 Number of respondents according to the number of air fresheners available in the house

The bar graph demonstrated in figure 4.5 as well as table 4.5 represents the **UNVERSITIEXNIXAL MALAYSIA MELAKA** respondent's choice when purchasing an air freshener. Respondents were to rank the preference feature on an air freshener using a six-point scale for these questions. Color, aroma, pricing, design, and design are the five things to consider when purchasing air fresheners. As shown in the bar graph all features is important base on the voting on scale 6. Besides, the higest number of respondents voting with number 66 person for the branding. Then, respondents may buy the air freshener based on the color which is has been voted by 65 respondents Aside from that, the next feature that respondents prefer to buy air freshener is the scent. There are 60 persons voted. The least preference when buying the air freshener is the price, only 49 persons are voting for that.

Preference	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5	Scale 6
Colour	0	0	2	2	1	65
Scent	2	0	1	2	7	60
Price	0	0	7	7	5	49
Design	0	0	2	4	7	57
Brand	0	0	1	1	2	66

 Table 4.5
 Number of respondents according to buyer preference.



Figure 4.5 Number of respondents according to buyer preference.

Furthermore, one of the reasons a person buys an air freshener is because it is in great shape. As a result, table 4.6 and graph 4.6 demonstrate the features that may convince a consumer to purchase the air freshener. Respondents were asked to select five out of seven features that would persuade them to buy it. The seven options are as follows: attractive shape, affordable price, trendy, uniqueness, reusable, attractive color, and easy handling. According to the table 4.6, the attribute that most influences respondents' purchase decisions is appealing shape, with over 90 percent of all respondents voting for it. Next, is the most attractive features that attract customers is easy handling product design, there have 57 persons tat select these features. After that is the least features that respondents vote is re-useable product. These characteristics are supported by 42 of the 70 respondents. Other characteristics such as trendy, uniqueness, affordable price and attractive color were chosen by 50, 49, 46, and 43 persons of those surveyed.

Feature	Frequency	Ranking
Attractive Shape	63	1
Affordable Price	46	5
Trendy	50	3
Uniqueness	49	4
Reusable	42	7
Attractive Colour	43	6
Easy Handling	57	2

 Table 4.6
 Number of respondents according to product features

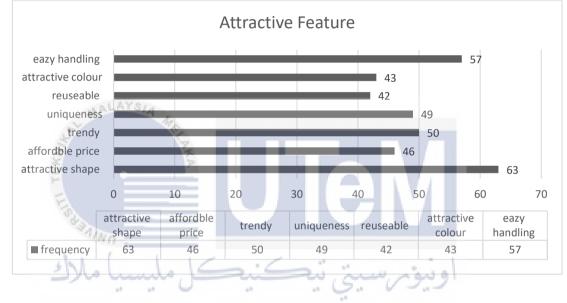


Figure 4. 6 Number of respondents according to product features

4.4.3 Kansei's Word Evaluation

Figure 4.7 displays 17 Kansei's words that are appropriate for the product design of an air freshener's casing. It also displays three definitions for each word from three dictionaries: Oxford, Longman, and Webster Merriam. In this part, respondents must choose five Kansei words that represent their feeling or judgement while choosing a product design.

8		1A	Attractive and exciting in an interesting way					
	1.	1B	Feel rich and glamor					
	Elegant	10	Make you feel confident and delighted					
		2A	Popular or fashion at a particular time					
	2.	2B	Latest trend					
	Trendy	2C	Not really elegance					
	3.	3A	Creative, imaginative, inventive or original					
	Eve	3B	Aesthetically pleasing					
	catching	30	Relating to or characteristics of arts or artist					
	catching	SC	Possessing qualities that give great pleasure to see, hear, think					
	4.	4A	about, etc.					
	4. Beautiful	4B						
	Deautifui	40	Wonderful; very pleasing and satisfying Physical appearance is considered extremely attractive					
		5A	Magnificent and imposing in appearance, size, or style.					
	5.	5B	Referring to the largest or most significant item of a type					
	Grand	5B	Outstanding, extremely pleasant, or interesting					
		6A	Zero expression					
	6.	6B	No decoration					
	Plain	6C	No decoration No regular or fixed					
	Constanting and Con-	60						
	-	7A	Judged over a period to be the highest quality and outstanding of its kind					
	7. Old fashion	70						
	Old fashion	7B	Typical, classic, antique, and vintage,					
		7C	A work of art of recognized and established value					
	8.	8A	Having more than one colour Good combination of colour					
-	Dual colour	8B 8C						
		9A	Making surrounding look colourful Defined by or employing cutting-edge method, concept, or equipment					
	9.	9A 9B						
	9. Modern	98	Changeable from old to new development timing Denoting a current or recent style or trend in art that marked by a					
	Modern	90	significant departure from traditional styles and values					
	Brie at	10A	the condition of having or showing a variety of colours					
	10.	10A	Creating a colourful environment					
5	Multicolour	100	Colour scheme is excellent.					
3		11A	Fashionably and elegant and sophisticated					
	11.	11B	Influenced by fashionable people					
	Stylish	110	Admired by many people					
-	12.	12A	Simple operation					
E	Easy	12B	Having or experiencing satisfaction and security					
2	handling	12C	Handy to used					
		13A	Pleasing or appealing to the senses					
	1/1/13.	13B	Catching the intention					
1.1	Attractive	13C	Showing good aesthetic judgement					
5 N	1.11	14A	No special features					
- 7	14	14B	Typically occur and usually seeing					
	Ordinary	14C	Familiar object					
		15A	Unlike anything else					
IND	15.	15B	Different appearance from other product					
JMI	Unique	15C	Not easy to get					
		16A	Natural or casual					
	16. Simula	16B	No attractive appearance					
	Simple	16C	Nothing much decoration appearance					
1	17	17A	The colour used is primary colour					
	17. Bricht	17B	Colour is extremely thick or vividly brilliant					
	Bright	17C	Shining or glowing brightly					

Figure 4. 7 17 Kansei words

Moreover, from the results that have been selected by the respondents, the top five will be used in the main survey. Table 4.7 and figure 4.8 represents the results of the Kansei word selection using a bar graph. According to the graph in figure 4.8 the highest number of respondents shows at the Kansei word beautiful with the value is 38 respondents. Second highest number of respondents with value 33 persons at the Kansei word plain. For the old-

fashioned word Kansei there is not much difference in the number of respondents with the usual Kansei word which is 32 people. Kansei's words elegant and eye-catching have had the same value in due to the number of responders, which is 30.

	Kansei Word	Frequency		
	Elegant	30		
	Trendy	22		
	Eye Catching	30		
	Beautiful	38		
	Grand	26		
	Plain	33		
	Old Fashion	32		
	Dual Colour	26		
MALAYS/A	Modern	23		
	Multicolour	16		
	Stylish	20		
	Easy Handling	18		
	Attractive	12		
1/kn	Ordinary	6		
	Unique	9		
لىسىام	Simple	3		
** **	Bright	69. 09.9		

 Table 4.7
 Number of respondents according to Kansei words

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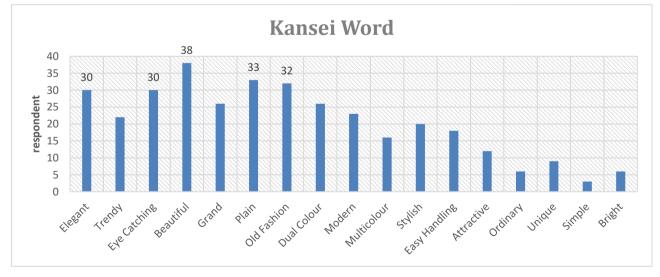


Figure 4.8 Number of respondents according to Kansei words

4.4.4 Product Selection Evaluation

Shape that shows on the object is one of the factors that can influence emotion of customers in making decision. In figure 4.9 shows 35 pieces of air fresheners with five categories that represent different shape and outer features. As the purpose for this part is to reduce the number of product design based on the categories to get only one design to be used in the main survey. Table 4.8 and bar graph in figure 4.10 displays the outcome based on the responses. As a result, design A (25 persons), C (19 persons), D (26 persons), E(28 persons), F (29 persons) and G (23 persons) most of the respondents choose the first design meanwhile design B most respondents choose second design.





Figure 4.9 Air freshener with five categories

Design	А	В	С	D	Е	F	G
1	25	14	19	26	28	29	23
2	14	15	17	8	9	13	12
3	16	13	7	9	10	14	12
4	3	14	9	17	13	6	13
5	12	14	18	10	10	8	10

 Table 4.8
 Number of respondents according to design

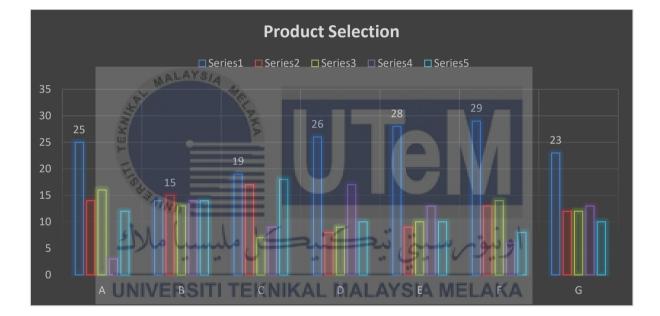


Figure 4.10 Number of respondents according to design

4.5 Main Survey Evaluation

The main survey is the questionnaire that is more focused on finding out the interest in customers regarding choosing the air freshener for their house. This questionnaire, it had been asking more detail about the respondent's feelings using chosen Kansei words in the pre-survey to do the design evaluation. Aside from that, it also had questions regarding functionality and dysfunctionality regarding the air freshener. Same as pre-survey, main survey also has been constructed using Google form and distributed via social media. 62 persons have been responded to this survey. As mentioned before main survey consist of three main section which is demography, product attribute and product design (Kano questionnaire).

4.5.1 Main Survey General Information Evaluation

This demography section divided into two part which is demography information and product background. Gander, age, and occupation status have been asked in demographic section while price preference, first preference toward product asked in the product background.

According to Table 4.9, there were men are majority responds to this survey. Figure 4.11 illustrated the bar chart conversation based on the gender data collected from the survey. There are 38 male respondents and 24 female responders among the 62 participants who responded to this survey

Table 4. 9 Number of respondents according to gander

سيا ملاك	Gander	Frequency
18	Female	-24
	Male	38
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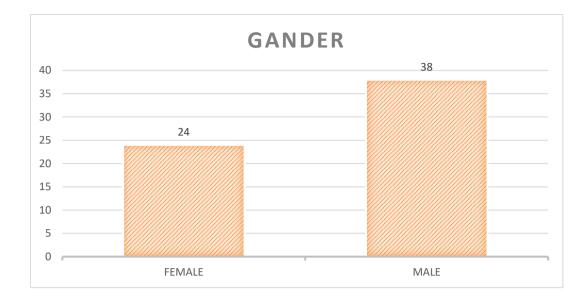


Figure 4. 11 Number of respondents according to gander

Table 4.10 demonstrates the age range of persons who responded to the survey. There are four age categories to pick from: 18-30, 31-40, 41-50, and 51 and above. Figure 4.12 shows pie chart clearly shows that the age range of 18 - 30 years old has the most participants, with 56% from total respondents have replies to this survey. Meanwhile, just 9 people in the age groups 31-40 participated. Respondents between the ages of 41 and 50 have the fewest number of respondents, with only seven people. Finally, 11 people between the ages of 51 and older responded to this survey.

Table 4. 10 Number of respondents according to age

Age	Frequency
18-30	35
31-40	9
41-50	7
51 and over	11
Total	62

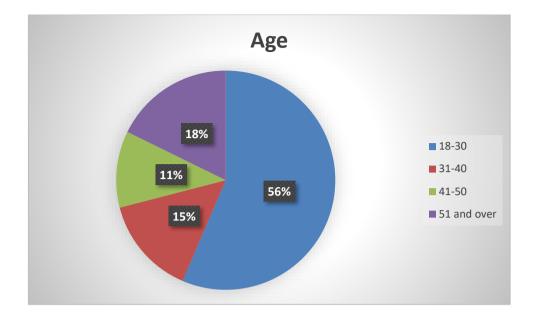


Figure 4. 12 Number of respondents according to age

The final question in demographic section is about responder's occupation status which there have six groups: student, unemployed, under employed, self-employment, profession, and retired. Table 4.11 indicates the number of frequencies. The majority of the respondents to this survey are students, with a total of 33 respondents. It is clearly shown in the figure 4.13. The second highest group of occupation is retired with the value 11 persons. It can relate to the previous question regarding the age of respondent where the age of 51 and above also have the same amount of respondent. Next, the group that has the least number of respondents the respondents the responded to this survey is self-employment, there only 4 persons.

Occupation	Frequency
Student	33
Unemployed	6
Under Employment	6
Self-employment	4
Profession	2
Retired	11
Total	62

 Table 4. 11
 Number of respondents according to occupation

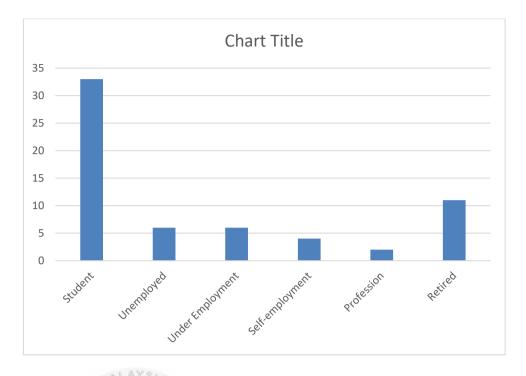


Figure 4. 13 Number of respondents according to occupation

After that, for the second section is about the product background. Where the first question is about the price preferences. Four price preference have been stated in the question: below RM 20, RM 20- RM 30, RM 31- RM 40, and RM 41 and above. As shown in table 4.12 the highest frequency is 56 persons who are vote for price preference below RM 20. Only 6 persons that choose the product price range between RM 20 to RM 30 as their price preference.

 Table 4. 12
 Number of respondents according to price preference

Price Preference	Frequency
below RM 20	56
RM 20- RM 30	6
RM 31- RM 40	0
RM 41 and above.	0
Total	62



Figure 4. 14 Number of respondents according to price preference



4.6 Product Design Analysis

In this study, correlation has been used as a statistical method to find out the strength of relationships in two variables. there are two sets of variables that are needed to find the relation which is the relationship between kano and Kansei next is the relationship between Kansei and Kansei. As both relationships will be used in product design development to produce new designs. Other than that, the correlation calculated by using SPSS software. By using SPSS software, the qualitative data have been converted to qualitative data. As well as the schematic data also converted to qualitative data to make it easy to be analyze.

4.6.1 Data Analysis for Relation Kansei and Kansei

AALAYS/

The purpose of this data analysis was to define the designs but to also extract the emotions, sentiments, and ideas expressed by respondents in the primary survey in response to each design. Every design has their own attractive features that make it different from other design. In aspects of correlation, the most significant value (1 percent level of significance)

and the strongest link were included in the study.

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By referring to the table 4.13 shows the correlation between two Kansei's word in design A. Based on the data above there have five data correlation at 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design A. However, the correlation coefficient Pearson's r value shows in the table data above appeared only moderated positive and weak positive for significant correlation coefficient. There is moderate positive correlation between overall customer's view and Kansei's word 'beautiful' which is 0.405. From the r value, it shows that Design A have emotional preference which is beautiful. This feature can be derived from Design A that found on the air freshener's casing. Especially on the spray part which has a different pattern compared to other air freshener's casing designs. Figure 4.15 shows the labeled

features that represent Kansei word beautiful.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.338**	0.320*	0.325**	0.264*	0.405 ^{**} Moderate positive
Plain	0.338**	1	0.178	-0.037	0.186	0.342**
_Classic	0.320^{*}	0.178	1	0.122	0.038	0.393**
Eye-catching	0.325**	-0.037	0.122	1	0.013	0.176
Elegant	0.264^{*}	0.186	0.038	0.013	1	0.223
Overall	0.405**	0.342**	0.393**	0.176	0.223	1

 Table 4. 13
 Number of correlations between two Kansei word for Design A



Figure 4.15 Design A

II.Design B

From table 4.14, by referring the significant level which mark as star, all the data shows important relationship between both Kansei's word for Design B. The highest value of correlation coefficient in the table is 0.576 which is moderate positive correlation coefficient. It is shows that there has positive linear coefficient between the emotional preference 'classic' and the overall customer's overview about the product. From the correlation value, there have classic element in Design B features. By observing Design B features, the outer shape of air freshener's casing looks like classic and old-style shape.

Figure 4.16 shows the labeled features that represent Kansei word classic.

Table 4. 14	Number of	correlations	between two	o Kansei	word for D	esign B
14	A POINT					

	100 M	. O.				
Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1 🛀	0.384**	0.317*	0.255^{*}	0.322^{*}	0.388**
Plain	0.384**	1	.424**	0.334**	0.467**	0.548**
Classic	0.317*	0.424**)_	0.280^{*}	0.186	0.576 ^{**} Moderate positive
Eye- catching	0.255*	0.334**	0.280*	ست!ت	0.434**	0.455**
Elegant	0.322*	0.467**	0.186	0.434**	V -1-	0.414**
Overall	0.388**	0.548^{**}	0.576^{**}	0.455^{**}	0.414**	1
	JNIVERSI	TEK	VIKAL M	ALAYSIA N	IELAKA	

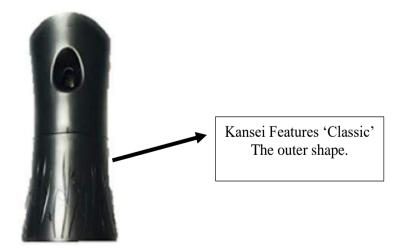


Figure 4. 16 Design B 74

III. Design C

From table 4.15 it shows the correlation between two Kansei's word from Design C. Based on the data above the highest correlation coefficient value is 0.506 and it is 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design C. There is moderate positive correlation between 'elegant' features and 'beautiful' features. From the r value, it shows that Design C have emotional preference which is beautiful and elegant. This feature can be derived from Design C that found on the air freshener's casing. Especially on the spray hole part and the pattern that same shape as the hole which has a different pattern compared to other air freshener's designs. Figure 4.17 shows the labeled features that represent Kansei word elegant and beautiful.

Kansei word	Beautiful	Plain	Classic	Eye- catching	Elegant	Overall
Beautiful	hunt a	0.153	0.104	0.267*	0.506 ^{**} Moderate positive	0.211
Plain	0.153	1	0.011	-0.034	0.479*	0.152
Classic	0.104	0.011	LMAL	0.138	-0.063	0.347**
Eye-catching	0.267^{*}	-0.034	0.138	1	0.050	0.237
Elegant	0.506^{**}	0.479^{**}	-0.063	0.050	1	-0.090
Overall	0.211	0.152	0.347**	0.237	-0.090	1

Table 4. 15 Number of correlations between two Kansei word for Design C

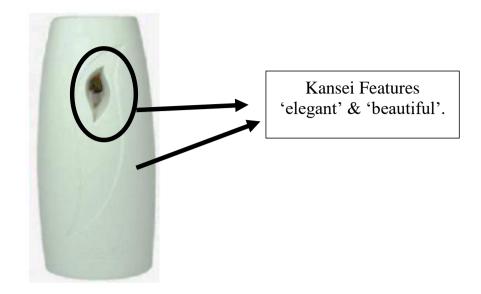


Figure 4. 17 Design C

IV. Design D

Only three data points in table 4.16 indicate a significant correlation relationship at 1% significant level between both Kansei's words for Design D, as shown by the significant level marked with a star. The correlation coefficient with the highest value in the table is 0.511, which is a moderate positive linear correlation coefficient. It proves that there is a positive linear correlation between the emotional preference 'classic' and the overall customer's attitude towards the product. There are classic elements in Design D characteristics based on the correlation value. By observing Design D features, the color, and the pattern on the air freshener's casing it probably looks muddy. Figure 4.18 shows the labeled features that represent Kansei word classic.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.203	0.195	0.203	-0.108	0.427**
Plain	0.203	1	0.207	-0.058	0.089	0.273**
Classic	0.195	0.207	1	0.038	0.088	0.511 ^{**} Moderate positive
Eye- catching	0.203	-0.058	0.038	1	0.224	0.243
Elegant	-0.108	0.089	0.088	0.224	1	0.190
Overall	0.427^{**}	0.373**	0.511**	0.243	0.190	1

Table 4.16 Number of correlations between two Kansei word for Design D



Figure 4. 18 Design D

V. Design E

The correlation between two Kansei's words in Design E is seen in table 4.17. Based on the data presented above, correlation at the 1% level of significance is accessible at the weak positive linear correlation coefficient of 0.378, which is also the greatest correlation value when compared to other data. That there is a link between two separate Kansei's words for Design E is indicated. According to the table above, the high degree of correlation exists between two variables which is total respondent overview and Kansei's term 'beautiful.' The r value indicates that Design E has an emotional preference, which is lovely. This feature is taken from Design E, which is located on the air freshener's casing and has additional features that distinguish it from other designs. Especially the top half, which is shaped differently from other air freshener case designs. Figure 4.19 shows the labeled features that represent Kansei word beautiful.

Table 4. 17 Number of correlations between two Kansei word for Design E

Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
1	0.188	0.166	0.226	0.363**	0.378 ^{**} Weak Positive
0.188	1	0.120	0.236	.303*	0.315*
0.166	0.120	1	0.233	0.083	0.350**
0.226	0.236	0.233	1	0.140	0.347**
0.363**	0.303*	0.083	0.140	1	0.211
0.378^{**}	0.315*	0.350**	0.347**	0.211	1
Nun المبر IVERSI	تل مليد TI TEKI				
	1 0.188 0.166 0.226 0.363** 0.378**	1 0.188 0.188 1 0.166 0.120 0.226 0.236 0.363** 0.303* 0.378** 0.315*	1 0.188 0.166 0.188 1 0.120 0.166 0.120 1 0.226 0.236 0.233 0.363** 0.303* 0.083 0.378** 0.315* 0.350**	1 0.188 0.166 0.226 0.188 1 0.120 0.236 0.166 0.120 1 0.233 0.226 0.236 0.233 1 0.363** 0.303* 0.083 0.140 0.378** 0.315* 0.350** 0.347** VERSITI TEKNIKAL MALA	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

Figure 4. 19 Design E

From table 4.18 it shows the correlation between two Kansei's word from Design F. Based on the data above the highest correlation coefficient value is 0.685 and it is 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design F. There is moderate positive correlation between 'elegant' features and 'beautiful' features. From the r value, it shows that Design C have emotional preference which is beautiful and elegant. This feature can be derived from Design F that found on the air freshener's casing. Especially on the spray outer shape which the curve is a different pattern compared to other air freshener's designs. Figure 4.20 shows the labeled features that represent Kansei word elegant and beautiful.

Table 4.18 Number of correlations between two Kansei word for Design F

2		5				
Kansei word	Beautiful	Plain	Classic	Eye-catching	Flogant	Overall
Beautiful	1	0.478**	0.611**	0.399**	0.685 ^{**} Moderate Positive	0.620**
Plain	0.478^{**}	1	0.120	0.415**	0.451	0.426**
Classic 🛓	0.611**	0.120	ait	0.256*	0.623**	0.539**
Eye-catching	0.399**	0.415**	0.256^{*}	· 9.1 V-	0.461**	0.631**
Elegant		0.451**	0.623**	0.461**	AKA	0.628**
Overall	0.620^{**}	0.426**	0.539**	0.631**	.628**	1

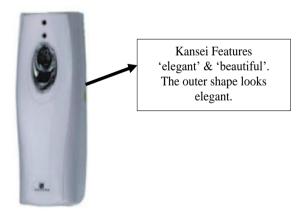


Figure 4. 20 Design F

VII. Design G

Table 4.19 shows a significant correlation link at the 1% level between Kansei's words 'Plain' and the average consumer perspective toward the product for Design G, with the greatest correlation value of 0.471. Person's product correlation has a modest positive linear correlation coefficient. Based on the correlation value, there are plain elements in Design G features. Observing Design G features, the only colour available is black, making Design G plain. The second highest correlation coefficient in the table is 0.451, which has a link between Kansei's words 'Plain' and 'Beautiful.' Because both correlations contain 'plain' Kansei's term as essential elements in Design G, it is possible to deduce that Design G is plain, yet the responder believes it is beautiful. Figure 4.21 shows the labeled features that represent Kansei word plain and beautiful

Kansei word	Beautiful	Plain	Classic	Eye- catching	Elegant	Overall
Beautiful	سا ملا	0.451 ^{**} Moderate Positive	0.208	0.415** •••••••••••••••••••••••••••••••••••	0.220 و نبو م	0.401**
Plain U	0.451** NIVERSI	FI TEKNI	0.138 KAL M/	0.295*	0.207 MELAK	0.471** Moderate Positive
Classic	0.208	0.138	1	0.208	-0.111	0.264^{*}
Eye- catching	0.415**	0.295*	0.208	1	0.144	0.129
Elegant	0.220	0.207	-0.111	0.144	1	0.238
Overall	0.401**	0.471**	0.264^{*}	0.129	0.238	1

Table 4. 19 Number of correlations between two Kansei word for Design G



Figure 4. 21 Design F

VIII. Analysis Summary

As shown in the table 4.20 is the summary for relationship between Kansei's word and Kansei's word for all design that have been selected. Throughout all, each design has its own representative, in Kansei's words, that expresses emotion from responders. According to table 8, the majority design is based on beautiful Kansei's word, while there are two designs that are based on classic.

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Design	- AC	B	С	D	E.	E	G
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Indicator							

				Eye		
Kansei word	Beautiful	Plain	Classic	catching	Elegant	Overall
		0.451**			0.506**	0.405**
Beautiful					0.685**	0.378**
						0.471 **
Plain						
Classic						0.576**
Classic						0.511**
Eye catching						
Elegant						
Overall						

 Table 4. 20
 Summary Number of Correlations Between Two Kansei Word For 7 Design

4.6.2 Data Analysis for Relationship Kansei Word and Kano Model.

The goal of this data analysis was to establish the functionality of the product design. Every design has a function that makes it useful. In terms of correlation, the study contained the most significant value, 0.001 level of significance, and 0.005 level of

Vsignificance, as well as the strongest relationship.

او نبوم رسية رقبه a. Design A

Table 4.21 demonstrates the relationship between Kano's model and Kansei's word about Design A. Table 4.21 shows three significant correlations, one at the 1% significant level and two at the 5% significant level. The maximum negative correlation value presented in table 4.21 is -0.371, indicating that the strength of the correlation is moderately significant but in negative value. That also is, the relationship between Kansei's term "Classic" and Kano's word "Wall Hanging" is moving in the opposite way or has an inverse correlation. In other words, when the Kano's word 'Wall Hanging' increases, the Kansei's word 'Classic' decreases. When Design A was not hung on the wall, it seemed more classic. Other than that, timer setting versus plain design is the highest positive value correlation that shown in the table 4.21 which is 0.318. The relationship between Kansei's word 'Plain' and Kano's word 'Timer setting' is moderate positive correlation. Next, the relationship strength between Kansei's word 'Classic' and Kano's word 'To replace the fill can' is 0.253 which is weak positive correlation. Each positive value is significant correlation at 5 % significant level. Since this correlation between Kansei's word and Kano's word is significant, it indicates that the connection has a better relationship. At total for Design A, the functionality can be described from the Kano's model section which is timer setting, to replace the refill can and wall hanging function.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.186	0 .318* Moderate Positive	0.163	0.204	-0.110	0.122
Charger Battery	0.022	0.046	0.101	0.036	0.003	-0.048
To Replace the Refill Can	0.219	0.208	0.253* Weak Positive	0.129	0.01	0.178
Timer Options	-0.244	0.032	0.006	-0.143	-0.121	-0.019
Wall Hanging	-0.194	0.047	-0.371** Moderat e Negative	0.086	-0.049	-0.026
Self-Spray Button	0.067	-0.044	0.238	0.083	0.102	0.045
Rectangul ar Shape	-0.031	0	0.118	-0.144	-0.095	0.069
Battery Indicator	0.150		-0.046	0.062	0.244	0.017
Spray Refill Indicator	U10.248	SIT <mark>0.062</mark> KN	0.064 M	AL0.068IA	M6.155K	0.175
Decoratio n Purpose	-0.016	-0.152	-0.005	0.028	0.082	-0.003
Vase Shape	-0.092	0.046	0.007	0.079	0.054	-0.043

 Table 4. 21
 Number of correlations between Kansei word and Kano model for Design A

b. Design B

By referring table 4.22 it shows the relationship of Kansei's word versus Kano's model regarding Design B. In the table there have four correlation that are significant at 0.05 level. The relationship between Kansei' word 'Plain' and Kano's word 'Vase Shape' shows the highest value in negative correlation which is -0.310. Since the correlation strength is moderate negative, which is the highest strength in the table, the variable can be extract as important feature for new design. from the inverse correlation which means Kansei's word 'Plain' increases while Kano's word 'vase shape' decreases. In other words, the casing of the basic design air freshener does not look a vase. Following that, there are two correlation values that are based on the same Kano's model word, which is charger battery. Both values are weak positive correlation value, but it is the highest strength correlation compared to other value. First is the relationship between Kansei's word 'Plain' and Kano's word 'Charger Battery' with the value 0.287. Second highest strength correlation on the table is relationship between Kansei's word 'Classic' against Kano's word 'Charger Battery' with the value is 0.268. Since both correlations are positive, an air freshener with a rechargeable battery is preferred, whether the style is basic or traditional. Finally, a significant correlation exists between Kansei's word 'Beautiful' versus Kano's word 'Rectangular Shape', although its strength is small, and it is represented by the number 0.260. It is claimed that such beautiful design is featured in rectangle form



Figure 4. 23 Design B 85

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	-0.011	-0.052	-0.096	0.134	0.158	0.142
Charger Battery	0.205	0.287 [*] Weak Positive	0.268 [*] Weak Positive	0.002	0.227	0.177
To Replace the Refill Can	-0.046	-0.144	0.093	0.106	-0.095	-0.166
Timer Options	-0.077	0.227	-0.046	0.122	0.055	0.148
Wall Hanging	-0.208	0.014	-0.164	-0.09	-0.161	-0.089
Self-Spray Button	0.206	-0.021	0.076	-0.071	0.079	-0.029
Rectangul ar Shape	0.260 [*] Weak Positive	0.020	0.133	0.009	0.139	0.058
Battery Indicator	-0.190	0.187	-0.026	0.076	0.085	-0.079
Spray Refill Indicator	0.057	0.083	0.190	0.042	0.121	0.096
Decoratio n Purpose	-0.115 JNIVERS	0.118	-0.006 KAL MAL	0.126 AYSIA ME	-0.096 LAKA	0.003
Vase Shape	-0.025	-0.310* Moderate Negative	-0.233	-0.148	-0.155	-0.200

Table 4. 22 Number of correlations between Kansei word and Kano model for Design B

c. Design C

Table 4.23 presents the relationship between Kansei's term and Kano's model regarding Design C for air freshener's casing. There are just two significant correlations attributed with this design where the level of significant is 5%. First, the relationship between overall review from respondent about Design C and Kano's word 'Wall Hanging' shows a negative weak correlation with the value -0.269. That's mean the relationship is

invers correlation where most of the respondent does not like the air freshener hanging on the wall. Moreover, the greatest positive correlation value in the relationship is 0.262, which is carried by Kansei's word 'Eye Catching' and Kano's word 'Self Spray Button.'. It is stated that these two variables are independent of one another because the air freshener has a self-spray button, which is one of the features that the respondent desired.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.026	-0.014	-0.172	0.012	0.056	0.147
Charger Battery	0	-0.074	-0.001	0.042	0.008	-0.007
To Replace the Refill Can	-0.043	0.233	0.040	-0.102	0.071	-0.058
Timer Options	-0.080	-0.031	-0.078	0.005	-0.236	0.005
Wall Hanging	-0.058	0.025	-0.225	0.062	0.035	-0.269* Weak Negative
Self-Spray Button	-0.092	-0.034	0.067	0.262* Weak Positive	-0.127	0.107
Rectangula r Shape	0.086	0.115	-0.076	0.078	0.170	- 0.100
Battery Indicator	0.034	0.075	0.020	0.031	-0.194	0.221
Spray Refill Indicator	-0.017	-0.179	0.133	0.058	-0.131	-0.009
Decoration Purpose	سیا ملاك -0.054	-0.077	-0.099	0.118 0.118	او نبوه -0.106	-0.157
Vase Shape	-0.057	-0.008	-0.065	0.152	-0.134	0.186

 Table 4. 23
 Number of correlations between Kansei word and Kano model for Design C

d. Design D

Table 4.24 shows that there is just one significant correlation. The correlation that has highest value in the table 4.24 is state in relationship between overall overview from respondent and Kano's word 'Wall Hanging' with the value is -0.285. The value of correlation coefficient indicates that it is an inverse correlation, implying that the relation is reversible. Since, the relationship is inversely related, with the majority of respondents disliking the air freshener hanging on the wall. Next, from the table there no positive

correlation, so the highest positive correlation in the table has chosen as a preference for the next new design features for air freshener. The correlation between Knasei's word "eye-catching" and Kano's word "rectangular shape" is fairly strong, with a value of 0.216. Respondents believe that an air freshener in a rectangular form is more visually attractive.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.192	-0.013	-0.056	-0.001	-0.053	-0.046
Charger Battery	-0.016	0.110	0.095	0.141	0.144	0.171
To Replace the Refill Can	0.116	0.046	0.082	-0.157	0.115	0.024
Timer Options	0.118	0.096	-0.109	-0.032	-0.100	0.027
Wall Hanging	-0.232	-0.203	-0.117	-0.023	-0.029	-0.285* Weak Negative
Self-Spray Button	0.012	-0.14	0.051	0.145	0.099	0.006
Rectangular Shape	0.079	-0.13	-0.061	0.216 Weak Positive	0.152	-0.151
Battery Indicator	0.026	-0.088	-0.010	-0.088	0.086	0.103
Spray Refill Indicator	0.080	0.108	-0.079	-0.013	-0.050	0.174
Decoration Purpose	0.044	0.031	-0.106	0.024	-0.208	-0.015
Vase Shape	-0.039	-0.185	0.108	0.082	-0.026	-0.051

Table 4. 24 Number of correlations between Kansei word and Kano model for Design D

e. Design E

Next, table 4.25 show the value of correlation coefficient between Kansei's word and Kano's word. From the table 4.25 the highest value of the correlation coefficient is 0.273 with the level of significant 5%. The relationship is between Kansei's word 'Plain' versus Kano's word 'Wall Hanging'. The correlation coefficient has a low strength. Because the highest value is significant, it may be concluded that Design E lacks an appealing characteristic that will entice responders. According to the relationships that show a substantial association, respondents felt that Design E appeared simple when it was hung on the wall.



Figure 4. 26 Design E

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.134	-0.156	-0.108	-0.028	0.132	-0.054
Charger Battery	-0.181	-0.062	-0.044	0.029	0.019	0.025
To Replace the Refill Can	-0.170	0.035	-0.007	-0.071	-0.175	-0.072
Timer Options	0.089	-0.169	-0.167	-0.032	0.162	-0.183
Wall Hanging	-0.190	0.273 [*] Weak Positive	0.045	0.066	-0.190	0.060
Self-Spray Button	0.018	0.076	-0.025	0.105	0.036	-0.043
Rectangula r Shape	0.014	0.181	0.010	0.045	-0.130	-0.088
Battery Indicator	-0.179	-0.087	-0.077	-0.170	-0.046	-0.209
Spray Refill Indicator	<u>10.045</u>	-0.092	-0.062	0.039	0.006- ويبو	-0.092
Decoration Purpose	JN-0.096 SI	-0.068	(Al0.073\L/	Y 0.058/E	LA 0.036	0.159
Vase Shape	0.002	-0.067	-0.057	-0.196	-0.061	-0.128

Table 4. 25 Number of correlations between Kansei word and Kano model for Design E

f. Design F

Table 4.26 indicates that there are four significant correlation coefficients with a 5% level of significance. The first correlation has the greatest correlation coefficient value of 0.299 but the strength is weak. This relationship is based on the words 'Eye Catching' by Kansei and 'Spray Refill Indicator' by Kano. This shows that responders to Design F believe that an air freshener would be more attractive if the design included a spray refill indicator.

In addition, the second highest correlation coefficient from table 4.26 shows in the relationship between Kansei's word 'Beautiful' versus Kano's word 'timer setting with the strength of correlation also weak positive. As a consequence of the results, it is apparent that Design F has a great feature on timer setting. Besides, the relationship that also have 5% significant level of correlation coefficient is between Kansei's word 'Elegant' and Kano's word 'Wall Hanging' with the value of correlation coefficient -0.260. Since the coefficient value is negative, the link between the two variables is inverse, which implies the air fresheners may seem more beautiful if they are not hung on the wall. Lastly, the relationship between Kansei's word 'Classic' and Kano's word 'Charger Battery' which have the correlation coefficient value 0.253. It's really conceivable that Design F would seem more classical if it came with a charging battery.



Figure 4. 27 Design F

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.261* Weak Positive	0.107	0.198	0.094	0.083	0.069
Charger Battery	0.141	-0.086	0.253* Weak Positive	0.062	0.119	0.201
To Replace the Refill Can	0.197	-0.067	0.042	-0.154	0.119	-0.122
Timer Options	-0.160	0.060	-0.242	-0.055	-0.201	-0.104
Wall Hanging	-0.183	-0.005	-0.151	-0.056	-0.260* Weak Negative	-0.101
Self-Spray Button	0.070	-0.056	0	0.021	0.021	0.163
Rectangular Shape	0.054	0.201	-0.042	0.009	0.018	0.034
Battery Indicator	0.019	-0.166	0.227	0.022	0.178	0.096
Spray Refill Indicator	0.127	-0.090	0.175	0.299* Weak Positive	0.160	0.225
Decoration Purpose	-0.223	-0.099	(<u>40.015</u> A	LA <u>V</u> 670 N	IE-0.165 A	-0.182
Vase Shape	-0.114	-0.048	-0.139	0.018	-0.043	-0.121

Table 4. 26 Number of correlations between Kansei word and Kano model for Design F

g. Design G

Table 4.27 demonstrates the relationship between Kano's model and Kansei's word about Design G and five correlation coefficient that have same level of significant coefficient which is 5%. The highest value of correlation coefficient that have in the table 4.27 is -0.295 which is from the relationship between Kansei's word 'Eye Catching' between Kano's word 'Vase Shape'. Since the correlation value is negative, it implies that the correlation is inverse, thus the conclusion is that the design, which has a vase form, is indeed not particularly desirable. Moreover, there are two correlation values that are based on the same Kansei's word, which is classic. Both values are weak negative correlation value. The first relationship is between Kansei's word 'Classic' and Kano's word 'Self Spray Button,' that has a larger value than the other, since it has a value of -0.292. Second, is the relationship between Kansei's word 'Classic' and Kano's word 'wall hanging', with the correlation value -0.278. As a consequence of the results for both relationships, it is possible to interpret that Design G seemed less classic if the air freshener was hung from all or had a self-spray button. In the same way, there have al so two correlation that is significant in the same column on the Kansei's word which is elegant. First is the relationship between Kansei's word 'Elegant' and Kano's word 'Rectangular Shape' with the value 0.275. Since the strength of the correlation is positive weak relationship so, the correlation is directly proportional. That would be to say, Design G appeared elegant in the rectangular shape. Lastly, the relationship between Kansei's word 'Elegant' and Kano's word 'Battery Indicator' with value of correlation coefficient is -0.269. As a result, design G seemed elegant without the battery indicator UNIVERSITI TEKNIKAL MALAYSIA MELAKA

C

Figure 4. 28 Design G 95

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.139	0.046	0.030	-0.050	0.046	-0.055
Charger Battery	-0.090	0.118	-0.195	0.064	0.099	-0.248
To Replace the Refill Can	0.095	0.007	-0.040	0.117	0.031	-0.111
Timer Options	-0.087	-0.039	-0.049	-0.155	-0.141	0.035
Wall Hanging	-0.135	0.067	-0.278 [*] Weak Negative	0.111	-0.076	-0.065
Self-Spray Button	-0.002	0.002	-0.292 [*] Weak Negative	0.064	0.219	-0.160
Rectangula r Shape	0.082	-0.020	-0.155	0.081	0.275* Weak Positive	-0.122
Battery Indicator	-0.017	-0.048	0.107	0.031	-0.269* Weak Negative	-0.103
Spray Refill Indicator	0.137	0.035	0.032	0.172	-0.145 و نې	-0.107
Decoration Purpose	INI-0.002SIT		AL-0.023_A	(SI0.137EL	AK-0.159	-0.140
Vase Shape	-0.135	-0.101	-0.112	-0.295* Weak Negative	0.098	0.158

Table 4. 27 Number of correlations between Kansei word and Kano model for Design G

h. Analysis Summary

Table 4.28 shows the summary for relationship between Kansei's word and Kano's word for all design that have been selected. The purpose for this summary is to shortlist the relationship between design and the functionality for the air freshener. According to the chart, the wall hanging Kano's word has 5 designs on it. As a result, it is possible to conclude that wall hanging is the most important functionality that can be extracted from this table

Design	A	B	C	D	E	F	G
Indicator							

Table 4. 28Summary Number of Correlations Between Kansei Word and Kano Model
For 7 Design

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.261 *	0.318*				
Charger Battery	AVe.	0.287*	0.268* 0.253*			
To Replace the Refill Can	ALLAN .		0.253*			
Timer Options	2					
Wall Hanging		0.273*	-0.371** -0.278*	ΞW	-0.260*	-0.269* -0.285*
Self-Spray Button	n .		-0.292*	0.262*		
Rectangular Shape	0.260*	فنيك	1 in	0.216	0.275 *	
Battery Indicator					-0.269*	
Spray Refill Indicator	KSIIITEI	(NIKAL I	MALAYS	0.299*	A	
Decoration Purpose						
Vase Shape		-0.310*		-0.295*		

4.6.3 Kano Model Evaluation.

The Kano model is used to determine customer satisfaction based on consumer requirements for a product characteristic, which is functionality. Standard Kano models are used code like M>O>A>I (Must-be, one dimensional, Attractive and indifferent) to determine Kano model attributes based on client requirements and decision making. The Kano analysis is used to classify respondents' expectations based on the combination of consumer reactions to both functional and dysfunctional questions.

Table 4.28 displays the results for the Kano question, which was answered by 62 people. As the purpose for Kano model question is to evaluate features on function based on the probability to satisfy the user or consumers. The result from Kano question shows majority leads at the indifferent category which is nine functions lies on this category. There are two function that have highest number on Questionable category which is timer setting and battery charger with value 43 and 21 respectively. Generally, Must-be category is most important in product develop design. For charger battery functioning, there are three highest values with minor differences that range into the categories of questionable, indifferent, and must-be so, the charger battery could be changed to must-be. The minor difference value is 4. The evaluation data for indifferent category is replace the refill can (41), timer option (53), wall hanging (40) , Self-spray button (38), rectangular shape (35), battery indicator (23), spray refill indicator (34), decoration purpose (39) and vase shape (38).

Product Requirement	A	0	Μ	Ι	R	Q	Total	Category
Timer Setting	0	0	12	3	4	43	62	Q
Charger Battery	0	0	17	18	6	21	62	Q
Replace the Refill Can	0	0	5	41	12	4	62	Ι
Timer Options	0	0	4	53	3	2	62	Ι
Wall Hanging	0	0	8	40	13	1	62	Ι
Self-Spray Button	0	0	11	38	11	2	62	Ι
Rectangular Shape	0	0	16	35	8	3	62	Ι
Battery Indicator	0	0	23	23	12	4	62	М
Spray Refill Indicator	0	0	17	34	6	5	62	Ι
Decoration Purpose	0	0	12	39	10	1	62	Ι
Vase Shape	0	0	9	38	13	2	62	Ι
ليسيا ملاك	کل ما	2		عين ر	÷	يوس	اود	

Table 4.28 The Result for Kano Question

4.6.4.1 CS Coefficient, SITI TEKNIKAL MALAYSIA MELAKA

The CS-coefficient of customer disappointment is followed by a minus sign to indicate that

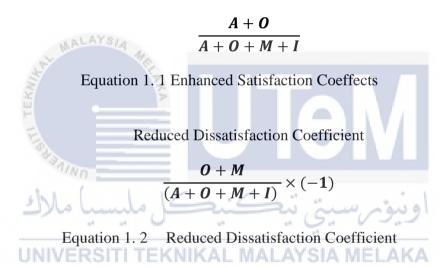
if this product quality is not reached, it will have a negative influence on customer satisfaction. The positive CS coefficient ranges from 0 to 1; the closer it is to 1, the higher the effect on customer satisfaction. A positive CS-coefficient close to 0 suggests that the impact is insignificant. At the same time, the negative CS-coefficient must be considered.

If it reaches zero, the influence on consumer dissatisfaction is especially strong if the examined product attribute is not satisfied. A value close to 0 implies that failing to

achieve this attribute results in no discontent

The respondent's satisfaction coefficient measures how many satisfactions increases when a product need is supplied and decreases when a need is not met. It is beneficial to evaluate the average impact of a product or service requirement on overall customer satisfaction. This coefficient is calculated using the following questionnaire. When the two or three most compelling requirements for each consumer group are met, the outcome is an unrivalled mix of product attributes. By adding the must-be and one-dimensional columns and dividing by the same normalization factor, the average impact on dissatisfaction can be calculated.

Enhanced Satisfaction Coeffects



By referring to the table 4.29 it shows that the reduced dissatisfaction coefficient column has highest value which is -0.8 where the product functionality is timer setting. Other than that, the second highest value from the same column is -0.5 which the product requirements is battery indicator. Since the value is nearest to -1 it shows that the feature needs to be included in the product design or else it cm make strong impact on customers dissatisfaction.

Product	A	0	Μ	Ι	Total	Category	$\frac{A+O}{A+O+M+I}$	$\frac{\boldsymbol{O}+\boldsymbol{M}}{(\boldsymbol{A}+\boldsymbol{O}+\boldsymbol{M}+\boldsymbol{I})}$
requirement							M + O + M + I	
								× (-1)
Timer	0	0	12	3	62	Q	0	-0.8
Setting								
Charger	0	0	17	18	62	Q	0	-0.48
Battery								
To Replace	0	0	5	41	62	Ι	0	-0.11
The Refill								
Can								
Timer	0	0	4 AYSI	53	62	Ι	0	-0.07
Options	32	A.C.		40				
Wall	0	0	8	40	62	Ι	0	-0.16
Hanging 💾			-					1
Self Spray	0	0	11	38	62	I	0	-0.22
Button	14	/wn						
Rectangular	0	0	16	35	62		0	-0.31
Shape	/			ang	0	5	- <u>S</u> - N	29.
Battery	0		23	23	EK ⁶² II	AL&MAL	AYSIA MELA	-0.5
Indicator								
Spray Refill	0	0	17	34	62	Ι	0	-0.33
Indicator								
Decoration	0	0	12	39	62	Ι	0	-0.23
Purpose								
Vase Shape	0	0	9	38	62	Ι	0	-0.19

Table 4. 29 The Result for CS Coefficient

4.7 Morphological Chart.

Table shows morphological chart that have been construct from both summary table that shows relationship Kansei's word and Kano model. The aim of this chart is to capture the required product functionality and to investigate alternate strategies and combinations of delivering that functionality. There may be several different solutions for each element of product function. There have three concept that shows from the same morphological chart.

Every concept has their own sketching idea of the product.



Options Function	1	2	3	4
Body shape		*		***** ***
Nozzle shape				
Timer Setting	Adjustable button	Button	eN	
ملاک Power supply IVE	AA Battery	Electric supply	Rechargeable battery	او A
Refill can compartment	Socket	Flip		

Table 4. 30The morphological chart

A. Concept 1

13	able 4. 31 The mo	rphological char	t for concept 1	
Options Function	1	2	3	4
Body shape		*		
Nozzle shape				
Timer Setting	Adjustable button	Rutton		
Power supply	AA Battery	Electric supply	Rechargeable battery	او
Refill can compartment	Socket	Flip		

Table 4. 31The morphological chart for concept 1

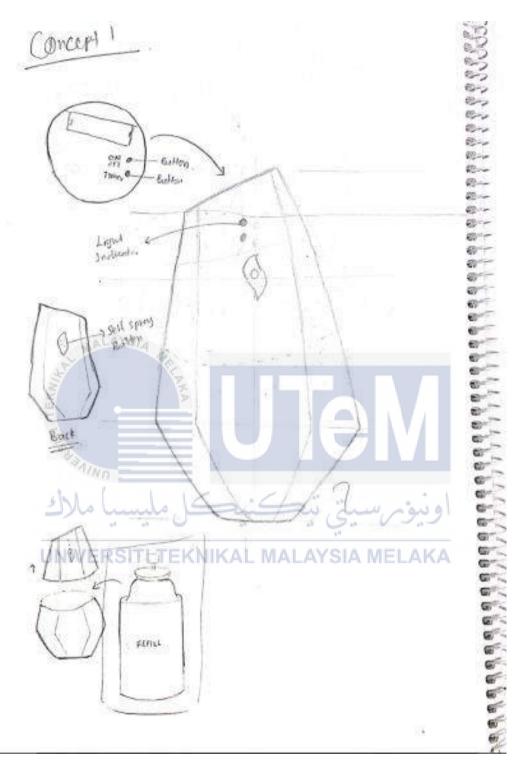


Figure 4. 29 Sketching for concept 1

B. Concept 2

13	able 4. 32 The mo	rphological char	t for concept 2	
Options Function	1	2	3	4
Body shape		*		100
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	او
Refill can compartment	Socket	Flip		16.00 E

Table 4. 32The morphological chart for concept 2

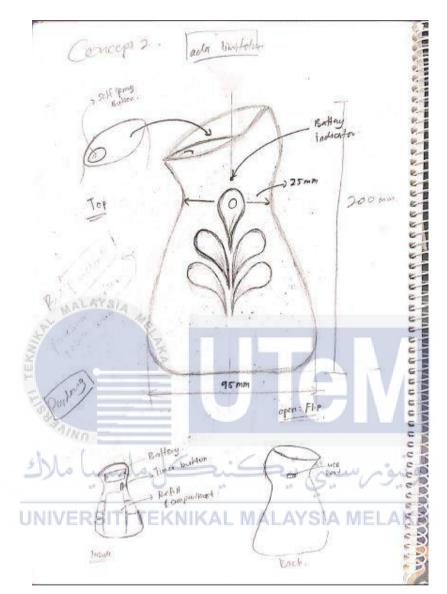


Figure 4. 30 Sketching for concept 2

C. Concept 3

18	able 4. 33 The mo	orphological cha	t for concept 5	
Options Function	1	2	3	4
Body shape		*	0	• 00 1 • 00 1
Nozzle shape				
Timer Setting	Adjustuble button	Button		1
Power supply	AA Battery	Electric supply	Rechargeable battery	او
Refill can compartment	Socket	Flip		

Table 4. 33The morphological chart for concept 3

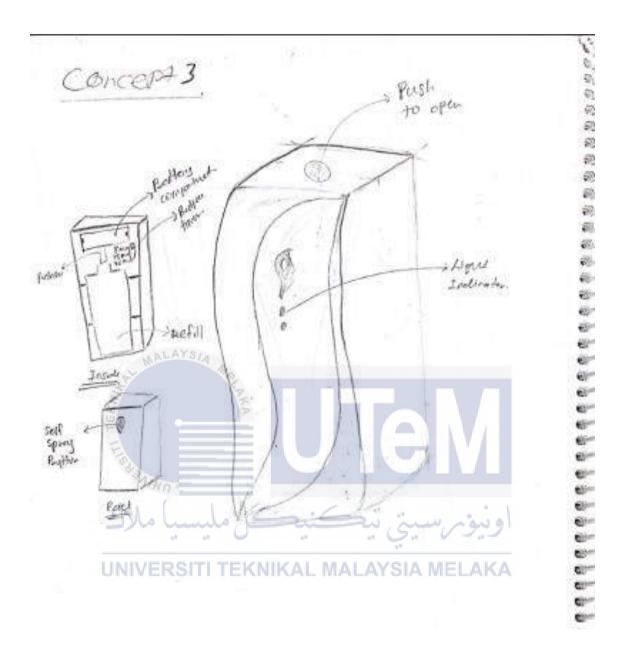


Figure 4. 31 Sketching for concept 3

4.8 Pugh Method.

Decision matrix is a kind of prioritization matrix that allows us to choose between the list of option in product design and based on criteria regarding the functionality. The aim by doing Pugh method is to focus the result to one decision. As the morphological chart generated three different concepts, the Pugh approach was used to pick only one design concept. The table 4.34 shows the Pugh method used to choose the new design of air freshener. By rank the matrix with +1, -1 and 0. Where the -1 value represent the concept lworse than the baseline in the criteria while the +1 value shows that the concept better than the baseline criteria while the 0 value represent the concept is same as the baseline. From the table 4.34 shows the total result for the concept 2 is higher than other so concept 2 have been chosen as a new design and can proceed to 3D modeling.

Table 4. 34 Pugh method

Criteria	Datum	Concept 1	Concept 2	Concept 3
Body shape	0	+1	+1	0
Nozzle shape	ىل مايىسىا ما		يور، • يتى ب	0
Timer Setting				0
Power supply	0	0	+1	0
Refill can	0	0	0	0
compartment	-			
Total		0	+2	0

4.9 Technical Drawing

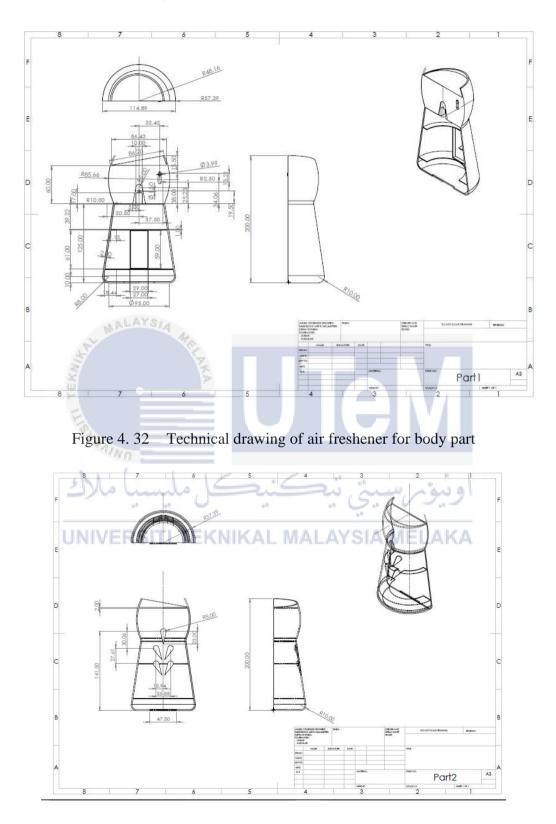


Figure 4. 33 Technical drawing of air freshener for cover part

4.10 3D modelling Design.

3D modelling is done using SolidWork software.



Prototype air freshener front.



Opened Prototype air freshener.

CHAPTER 5

CONCLUSION

5.1 CONCLUSION.

In this chapter, the summary on the findings in this project will be discussed, by referring to the first objective is to study on Kansei engineering and its application towards design on a product. As for this objective have been achieved in the study of Kansei engineering in literature review. In addition, the first objective also has been achieved in the first stem in chapter four which is when the construction of preliminary survey. the findings on the material regarding Kansei word as well as the product attribute.

Second objective is to analyze data using questionnaires by applying Kansei word embedding with Kano model. As for this objective, in chapter 4 the survey regarding Kansei and Kano model have been distributed and analyzed by using SPSS software to find the correlation between 2 variables which is Kansei and Kano variable. In spite of that, there have addition method in this product development which is Kano model method. As for this method for finding the functionality in the air freshener. As for Kano model purpose to find the customers satisfaction that meet their expectation. As the result that getting in the Kano model analysis it shows that the air freshener casing is indifferent. Which means the customers dos not really care if there have different or addition feature and function at the air freshener casing.

The last objective is to develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction). To achieve this goal, by using morphological chart to extract 3 concepts based on the feature that have been chosen by respondents. From that, Pugh method has been used to select one design in order to proceed for 3D modelling. Solidwork is the software that been used to do 3D modelling.

5.2 **RECOMMENDATION**

Kansei engineering is one of the approaches that may be utilized to enhance existing products as well as create new products based on consumer feedback or emotions. Furthermore, the Kano model is one approach for determining if a product meets the satisfaction and expectations of its customers.

- The first recommendation offered by this researcher is that product selection should be done carefully in order to carry out this technique. It is typically used to new items that have the potential to be revolutionary.
- 2. One of the most significant components in obtaining accurate results is the selection of the appropriate responders. Furthermore, the quantity of responders should be substantial. This is due to the fact that the correlation's results are also affected by the quantity of respondents.
- The final suggestion is to change the format of the survey to allow for face-to-face interviews. It is simpler to communicate with the respondent. This can also assist Kansei engineers obtain outcomes.

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APPENDICES

APPENDIX A Gannt chart for PSM 1 and PSM 2.

Activity/week	ALAYSIA		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion and verification the tittle and	synopsis. Proposal preparati	ion															
Student submits proposal to Supervisor a	and Committee (mind mapping	ng)															
Identify the problem statement and the	objectives	3	E4			_											
Identify scope, objective		-															<u> </u>
Define the literature review, introduction						-	7		-								
Build the flowchart of project (methodol	ogy)		F														
Submit draft report 1	- in the second																
Draft questionnaire 1 (product selection)	, distribute	Si	E		4.4 A.3	-			24								-
Getting data questionnaire 1	40 40		-		. (5.		1	10	1							
The do correction, submit second draft			100		~	en	L N		A	ZA							
Draft questionnaire 2 (sentiment survey)		ENNINAL	- 1717	-	4.1.	214	- IV		-	<u>-</u>							
Report of project																	

Activity/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Draft the preliminary questionnaire regarding product selection															
Construct preliminary survey															<u> </u>
Distribute the questionnaire															
Collect data preliminary survey															
Analyze data (will be used in main survey)	-														
Draft Main survey questionnaire (respondents' sentiment towaard product)							7								
Distributed main survey			7	-			7								-
Getting data main questionnaire															
Analyze main survey data	2				4										
Construct the morphological chart	-														
3D modelling product design	<	-	1 ⁴												
Report writing			1	5.		1	7.	2							

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Selection of Product Design Development On Air Freshener

Helio dear respondents, I am Nadiah Binti Zolkefle and third year student form Faculty of Mechanical and Manufacturing Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM) would like to conduct a survey related to the subject Bachelor Degree Project. The purpose for this survey is to classify customer/ consumer choice of the air freshener that available in the market. From this survey's result is used in product development to improvise or generate new product which is air freshener. I personally would like to say thank you in advanced and greatly appreciate your sincerely cooperation and support. Thank you.

* Required	
MALAYSIA	
SECTION A : DEMOGRAPHY	
2	
A)	
1. 1. Gander	
Mark only one oval.	
Female(////)	
Maje	/
کل ملیسیا مالاک	اوىيۇم سىتى بىكىيە

2. 2. Age NIVERSITI TEKNIKAL MALAYSIA MELAKA

Mark only one oval.

- 18-30 31-40 41-50
- 51 AND ABOVE

3. 3. Status of residence (Status tempat tinggal)

Mark only one oval.

Dive alone (tinggal sendiri)

Live with family (Tinggal bersama keluarga)

Live with roommate (Tinggal bersama rakan)

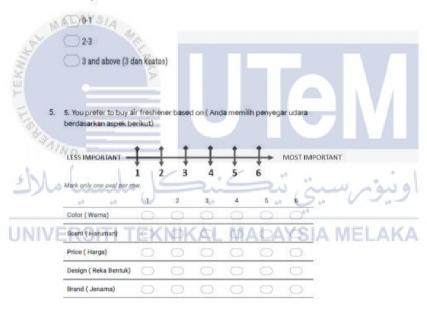
SECTION B: PRODUCT BACKGROUND

This survey aims to get the individual opinion and preferences when deciding to purchase an air freshener. Please tick in the box that represents your choice when buying a product. (Trigican ini bertujuan untuk mendepetkan pendapet den pilihan Individu ketika memutuskan untuk membeli penyegar udara. Tandakan di kutak yang mewakili pilihan anda semasa membeli produk.)

Can tick more than 1 box. (Boleh tanda lebih deri 1 kotak)

4. 4. How many air freshener do yo have in your house? (Berapakah bilangan penyaman udara yang anda ada?

Mark only one oval.



 a. The condition of the air freshener may attract my sense to buy it, is due to... (Keadaan penyegar udara mungkin menarik minat saya untuk membelinya, adalah kerana...) *

Check all that apply.

- Attractive shape (Bentuk yang menarik)
- Affordable price (Harga berpatutan)
- Trendy (Bergaya)
- Uniqueness (Keunikan)
- Reusable (Boleh digunakan semula)
- Attractive color (Warna yang menarik)
- Easy handling (mudah digunakan)

PART 2:

fresheners. Check the boxes that represent feelings and towards the product.

KANSEI WORD (Tinjauan ini adalah untuk mendapatkan pendapat dan perasaan setiap individu terhadap penyegar udara. Tandakan kotak yang mewakili perasaan dan produk.)

This survey is to get the opinions and feelings of each individual towards sir

7. Five (5) words that represent your emotional feeling to the air freshener are... (Lima
 [5] perkataan yang mewakili perasaan emosi anda kepada penyegar udara adalah ...)

L. Elegant	13	Feel Yech and glamor	
	1.4.4	AND A STOCK TO CARL AND AND AND A	
2.2.2.2.2.	10	Make you feel confident and delighted	
2		Popular or faction at a particular time	
Trendy	28	Latest trend	
- 241/1321	20	Not really riegance	
3.	23	Creative, imiginative, inventive or original	
Eye	39	Aesthetically pleasing	
catching	×	Relating to or characteristics of arts or artist	
	44	Possessing qualities that give great pleasure to see, bear, think	
4		about, etc.	
Beautiful	- 69	Wonderful: very pleasing and satisfying	
	*	Physical appearance is considered excernely anractive	
5	5A	Magnificent and imposing in appearation, star, or style.	
Grand	58	Referring to the largest or most significant item of a type	
110 3 000	×	Outstanding, commely pleasant or increasing	
2	- 5A	Zero expremitat	
6. Plain	69	Ne decoution	
Plais	60	No regular or fixed	
	7A	Judged over a period to be the highest quality and outstanding of	
2.	JA	its kind	
Old fashion	73	Typical, classic, antique, and vintage,	
1. and 2007.	7C	A work of art of recognized and established value	
444	-54	Naving more than one colour	
8.	63	Good combination of colour	
Dual colour	80	Making surrounding look colourful	
1.2	94	Defined by at employing outting edge method, concept, or equipment,	
9.	.03	Changeable from old to new development timing	
Modern		Denoting a current or recent style or trend in ort that marked by a	
1200200	90	significant departure from trachtional styles and values	
	204	the condition of having or showing a variety of colours	
10.	108	Creating a colourful environment	
Multicelsor:	100	Convision Section	
	234	Fashionably and elegant and sophisticated	
a part A.T		Influenced by fashionable people	
Stylish	110	Admitted by many people	
12.	124	Single Uperation	
Easy	328	Having Greenerkneing antidaction and accurity	
handling	330	Handy to glod	
minning	AEC	Pleasing of appending to the semias	
13,	158		
Attractive	138	Catching the intention	
		Showing good an thetic judgement	
24.			
Ordinary		Typically occur and us cally leving	
		Familiar object -	time and the second
15.		Unlike anything else	
Unique		Different appearance from other plocket	
100000		Not eaty to get	
11.16		Neteral or caseal	
Simple		No attractive appearance	
0.000		Nething much decenation appearance	
17.	17A	The roleur out is primary roleur	
Bright	17B	Colour is extremely thick or wildle billions	
	170	Shinking or glowing torighter	Sec. ed.

Elegant (Mewah)

Trendy (Bergaya) Eye catching (Menarik perhatian) Beautiful (Cantik) Grand (Agung) Plain (Kosong)
Old fashion (Klasik) Dual color (Warna ganda)
Modern (Moden) Multicolor (Pelbagai warna) Stylish (Bergaya)
Easy handling (Mudah diselenggara) Attractive (Menarik) Ordinary (Biasa) Unique (Unik) Simple (Polos)

8. PRODUCT SELECTION

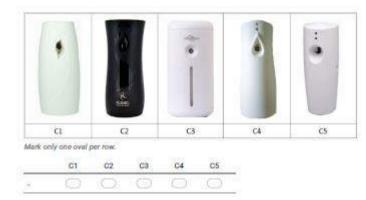
si, FROUDULT OCLECTION In this section respondent required to mark ONE (1) design of each row of automatic air fresheners product that you prefix. (Di shalegian in irresponden dilahendak) memandakan SATU (1) reka bentuk setiap barle produk penyegar udera automatik yang anda sukat.)

8. A*

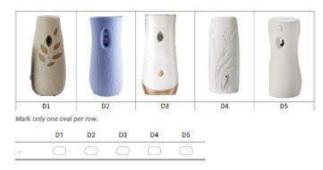








11. D*

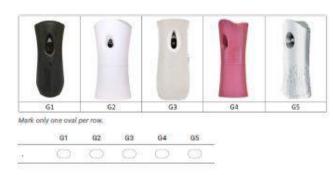


12 E*





14. G*



THANK YOU FOR YOUR TIME

APPENDIX C Main Questionnaire



AIR FRESHENER DESIGN SURVEY

Hello dear respondents, I am Nadiah Binti Zolkefle and third year student form Faculty of Mechanical and Manufacturing Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM) would like to conduct a survey related to the subject Bachelor Degree Project that supervised by Ts. Dr. Kamarul bin Amir Mohamed.

The purpose for this survey is to classify customer/ consumer choice of the air freshener that available in the market. From this survey's result is used in product development to improvise or generate new product which is air freshener. Emotional goods (Kansei Engineering) will be selected and studied in this questionnaire based on outformer preferences for consumer items. This questionnaire is divided into three sections. In Section 1, you are questioned on general information, product history, and customer views. Section 2 includes the Big 5 Inventory personality traits , which is connected to consumer characteristics, and Section 3 includes 7 furniture product designs with Kansel words to explain customer preferences on product design qualities based on Kansel Engineering.

Your participation is entirely voluntary, and all information you supply will be kept completely secret. I sincerely beg your support in participating in this study. I appreciate the time you took to help me with my research and promise to use the facts i've learned to think about and make beneficial changes. I personally would like to say thank you in advanced and greatly appreciate your sincerely cooperation and support.



2. 2. Age (Umur)*

A dande	a alter		man f
Mark	only	one	OVBI.

	18-30
	31-40
C	41-50
	51 AND ABOVE

3. 3. Occupation Status (Pekerjaan) *

Mark only one oval.

		in mark	
<u></u>	Stud	ent	

- Unemployed
- Under Employment
- Self-employment
- Profession
- Retired

B: Product background



SECTION 3 : PRODUCT ATTRIBUTE

This section requires you to rate on the words that describes the product.

7. Please rank the following words on a scale of 1 to 6 to indicate how much you agree or disagree with that statement. (Sila kedudukan perkataan berikut pada skala 1 hingga 6 untuk menunjukkan sejauh mana anda bersetuju atau tidak bersetuju dengan pernyataan tersebut.)



6. PRODUCT A*



Mark only one oval per row.

	1	2	3	4	5	6
Beautiful	0	0	0	0	0	0
Plain	0	0	\bigcirc	0	0	0
Old fashion (Classic)	0	0	\bigcirc	\odot	\bigcirc	0
Eye catching	0	0	0	0	0	0
Elegant	0	0	\odot	0	0	0
In overall, do you like this product?	0	0	0	0	0	0



INTA PLACE I I I	C. (), () (<u>с на</u>		11 01	er nur	- La Pal
	1	2	а	4	5	6	
Benutiful	0	0	0		0	0	

Beautirui		69		0	0	100
Plain	0	0	0	0	0	0
Old fashion (Classic)	0	\bigcirc	0	0	0	0
Eye catching	0	\bigcirc	\bigcirc	\bigcirc	0	0
Elegant	0	\odot	0	0	0	0
In overall, do you like this product?	\bigcirc	\bigcirc	\bigcirc	0	0	\bigcirc

8. PRODUCT C *



Mark only one oval per row.

Beautiful Plain Old fashion (Classic) Eye catching Biegant	0000	0	0 0	0	0	0	
Old fashion (Classic) Eye catching	0	0	0	0	0		
Eye catching	0	\bigcirc	0	0	10000		
-	5			-	\odot	0	
Flowert	×_×	\bigcirc	0	\bigcirc	\bigcirc	0	
the second second second second second second second second second second second second second second second s	0	Ø	0	0	\bigcirc	0	
In overall, do you like this	0	0	0	0	0	0	
9. PRODUCT D*							V
Alunersiti TE	کل	2		-	ġ.		ونيونه

Mark only one oval per row.

	1	2	з	4	5	6
Beautiful	0	\odot	0	0	\odot	\bigcirc
Plain	0	0	0	0	0	0
Old fashion (Classic	\odot	0	\bigcirc	0	\bigcirc	O
Eye catching	\bigcirc		0	\bigcirc	\bigcirc	0
Elegant	0	0	0	0	0	0
In overall, do you like this product?	Ø	\odot	\bigcirc	0	0	\odot

10. PRODUCT E*



Mark only one oval per row.

leautiful			3	4	5	6
	0	\bigcirc	Ð	0	0	0
lain	\bigcirc	0	\bigcirc	0	\bigcirc	0
Nd fashion (Classic)	0	0	0	0	0	0
ye catching	0	0	\bigcirc	0	0	0
legant	\bigcirc	0	0	0	0	0
n overall, do you ske this roduct?		0	\odot			0

للأك	ميا ه	ل مليا	نيك	تيك	يجي	اونيوس
UNIV	ERSP		NIKAL	MALA	/SIA	MELAKA

Mark only one oval per row.

	1	2	з	4	5	6
Beautiful	0	0	0	0	0	0
Plain	0	0	0	0	0	0
Old fashion (Classic)	0	0	\bigcirc	0	\odot	0
Eye catching	0	0	\odot	0	0	0
Elegant	0	0	0	0	0	0
In overall, do you like this product?	\odot	0	\odot	0	0	0

130

PRODUCT G *

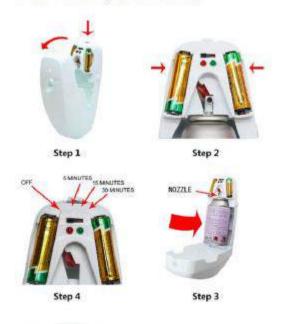


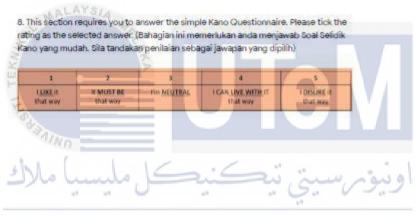
Mark only one oval per row.

Beautiful Plain Old fashion (Classic) Eye catching Elegant In overall, do you like this product? UTTERN		1	2		122			
Old fashion (Classic) Old fashion (Classic) Eye catching Old Old Old Old Old Old Old Old Old Old	Beautiful	\odot	0	0	0	0	\bigcirc	
Eye catching	Plain	\bigcirc	0	0	0	\bigcirc	0	
Elegant O O O O O O O O O O O O O O O O O O O	Old fashion (Classic)	\bigcirc	\odot	0	\odot	\odot	\odot	
In overall, do you like this OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO	Eye catching	\bigcirc	\odot	\bigcirc	0	0		
product? 0 0 0 0 0 0	Elegant	\bigcirc	0	\bigcirc	\odot	O	\bigcirc	
		0	\bigcirc	0	0	0	\odot	
	St. Martin	R.						

1, 14,000 (100

SECTION 4: Product Design (Kano Questionnaire)





Pers Presentation second and that

13. FUNCTIONAL: HOW DO YOU FEEL IF*

Mark only one oval per row.

	1	2	3	4	5	
The air freshener have timer setting	\odot	0.	0	0		
The air freshener use battery	0	0	0	0	0	
The air freshener easy to replace the refill can	\bigcirc	0	0	\bigcirc	\odot	
The timer can self setting	0	0	0	0	0	
The air freshener can hanging on the wall	0	0	0	Ö	0	
The air freshener have self spray button	0	0	0	0	0	
The shape design of air freshener is curvy and round shape	\odot	0	0	0	0	
The air freshener have battery indicator	0	0	0	0	\bigcirc	
The air freshener have spray refill indicator	0	0	0	0	\bigcirc	
The air freshener design is suitable for decoration	\bigcirc	\odot	\bigcirc	\odot	\odot	
The air freshener design look like vase	0	0	0	0	0	
section requires you to answer the as the selected answer.	e simple	Kano Qu		re. Please	tick the	
Disp'a, n examistrate Dn NTU at with that way.	TRAL	I CAN LINE that		tha	LIKE IE LWAY	
کل ملیسیا م	2	<u>`</u>	2	15	رس	1

14. DYSFUNCTIONAL: HOW DO YOU FEELS IF *

Mark only one oval per row.

	1	2	з	4	5	
The air freshener not having timer setting	0	0	\bigcirc	\odot	\bigcirc	
The air freshener using charger battery	\odot	\bigcirc	\bigcirc	\bigcirc		
The air freshener complicated to replace the refill can	0	\bigcirc	0	\odot	0	
The timer setting already have options	\bigcirc	0	\bigcirc	0	\bigcirc	
The air freshener cannot hanging on the wall	0	0	\odot	0	0	
The air freshener doesn't have self spray button	0	0	\odot	0	0	
The shape design of air freshener is rectangular shape	0	0	\odot	0	0	
The air freshener doesn't have battery indicator	0	0	\odot	0	0	
The air freshener doesn't have spray refill indicator	0	0	Ö	\bigcirc	0	
The air freshener design is not suitable for decoration	0	0	0	0	0	
The air freshener design do not look like vase	Ö	0	õ	0	0	
The air freshener design da not look like vase	seared norm			E	H	
کل ملیسیا ما	-	2	2	1,0	, w	ġ

APPENDIX	D SPSS	data	correlation
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		K1-timer setting	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatchi ng	D1_Elegant	D1_Overall
<1-timer setting	Pearson Correlation	1	.186	.318	.163	.204	110	.122
	Sig. (2-tailed)		.148	.012	.206	.111	.396	.345
	Ν	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.186	1	.338	.320	.325**	.264	.405**
	Sig. (2-tailed)	.148		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.318	.338	1	.178	037	.186	.342
	Sig. (2-tailed)	.012	.007		.166	.776	.149	.007
	Ν	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.163	.320	.178	1	.122	.038	.393
	Sig. (2-tailed)	.206	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.204	.325	037	.122	1	.013	.176
	Sig. (2-tailed)	.111	.010	.776	.346		.923	.171
	Ν	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	110	.264	.186	.038	.013	1	.223
	Sig. (2-tailed)	.396	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	.122	.405	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.345	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

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Output 🗾 🖌 🖉 🖉 🖉 🖉 🖉	Correlations								
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Correlations	K2-charger battery	Pearson Correlation	1	.022	.046	.101	.036	.003	048
Notes		Sig, (2-tailed)		.867	.720	.435	.782	.981	.714
Correlations	VERSIT	NTEKN	62	62	62	62	62	62	62
- 🖺 Log	D1_Beautiful	Pearson Correlation	.022	1	.338**	.320	.325**	.264	.405
Correlations		Sig. (2-tailed)	.867		.007	.011	.010	.038	.001
Notes		N	62	62	62	62	62	62	62
Correlations	D1_Plain	Pearson Correlation	.046	.338	1	.178	037	.186	.342**
- 📔 Log - 🔁 Correlations		Sig. (2-tailed)	.720	.007		.166	.776	.149	.007
Title		Ν	62	62	62	62	62	62	62
Notes	D1_Classic	Pearson Correlation	.101	.320	.178	1	.122	.038	.393
Correlations		Sig. (2-tailed)	.435	.011	.166		.346	.772	.002
Correlations		N	62	62	62	62	62	62	62
Title	D1_Eyecatching	Pearson Correlation	.036	.325	037	.122	1	.013	.176
Correlations		Sig. (2-tailed)	.782	.010	.776	.346		.923	.171
- Log		N	62	62	62	62	62	62	62
Correlations	D1_Elegant	Pearson Correlation	.003	.264	.186	.038	.013	1	.223
Title		Sig. (2-tailed)	.981	.038	.149	.772	.923		.082
Correlations		N	62	62	62	62	62	62	62
Log	D1_Overall	Pearson Correlation	048	.405**	.342	.393	.176	.223	1
Correlations		Sig. (2-tailed)	.714	.001	.007	.002	.171	.082	
Notes		N	62	62	62	62	62	62	62
Correlations	** Correlation is	significant at the 0.01 lev	al (2-tailad)						

itput					2				
Log				Correlatio	ns				
Correlations			K3-to replace therefill can	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatchi ng	D1_Elegant	D1_Overall
Correlations	K3-to replace thereful of	an Pearson Correlation	1	.219	.208	.253	.129	.010	.178
Log Correlations		Sig. (2-tailed)		.087	.105	.047	.317	.941	.166
- 🖆 Title		N	62	62	62	62	62	62	62
Notes Correlations	D1_Beautiful	Pearson Correlation		1	.338	.320	.325	264	405
Log		Sig. (2-tailed)	.087	62	.007	.011	.010	.038	.001
Correlations	D1_Plain	Pearson Correlation		.338"	1	.178	037	.186	.342"
🔄 Title 🔂 Notes	Contraction of	Sig (2-tailed)	.105	.007		.166	.007	.149	.007
- Correlations		IN IN	62	62	62	62	62	62	62
Log Correlations	D1_Classic	Pearson Correlation	.253	320	.178	1	.122	.038	.393**
-E Title		Sig. (2-tailed)	.047	.011	.166		346	.772	.002
🔂 Notes 🍙 Correlations		N	62	62	62	62	62	62	62
Log	D1_Eyecatching	Pearson Correlation	.129	325	037	122	1	.013	.176
Correlations		Sig. (2-tailed)	.317	.010	.776	.346		.923	.171
🕞 Title 🔂 Notes		N	62	62	62	62	62	62	62
Correlations	D1_Elegant	Pearson Correlation		.264	.186	.038	.013	1	.223
Log Correlations		Sig. (2-tailed)	.941	860,	.149	.772	923	0952	.082
個 Title		N	62	62 .405 ^{°°}	62	62	62	62	62
🔁 Notes 🍓 Correlations	D1_Overall	Pearson Correlation	11 COL 8 COL	502732.0	.342"	.393"	,176	.223	1
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DESIGN AND DEVELOPMENT OF AIR FRESHENER'S CASING BY USING KANSEI ENGINEERING AND KANO MODEL





Faculty of Mechanical and Manufacturing Engineering Technology



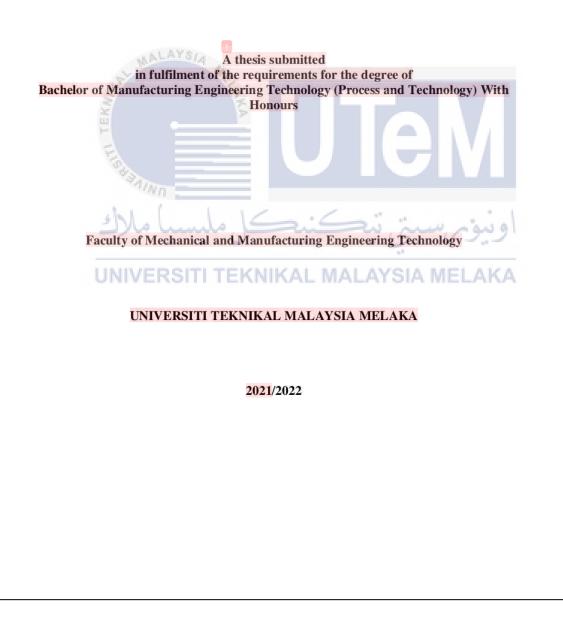
Nadiah Binti Zolkeflee UNIVERSITI

Bachelor of Manufacturing Engineering Technology (Process and Technology) With Honours

2021/2022



NADIAH BINTI ZOLKEFLEE



DECLARATION

I declare that this thesis entitled "Design And Development of Air Freshenre's Casing By Using Kansei Engineering" is the result of my own research except as cited in the references. The choose an item has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



APPROVAL

I hereby declare that I have checked this thesis, and, in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honors.



1 DEDICATION

This report is dedicated to my beloved parents in particular, for their endless love, support and encouragement. To my lecturer Ts. Dr Kamarul Bin Amir Mohamed who has guided me along the way to finish this project. Thank you for your support and give me strength until this project is finished.



ABSTRACT

Most of the design concepts available in the market come from the ideas of designers who sometimes have opinions that are contrary to the definition of custom design concepts and as a result, it is always confusing. The purpose of this research conducted is to improve the design of air freshener casing that meets customer demand by using Kansei Engineering. Kansei Engineering is a tool used to interpret human feelings and opinions from users or customers into design parameters. The result of this study is the design of the air freshener casing, which satisfies the psychological feelings of the customers. With reference to the main objectives in this research, three objectives have been proposed. First, to study on Kansei engineering and Kano model in air freshener's casing product design. The second objective was to analyse data using questionnaires by applying Kansei word embedding with Kano model. The final objective of this study was to develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction). The Kansei survey consists of two parts. In the first part, a pre-survey was conducted to collect data on customer preferences for air freshener products available in the market. With reference to the highest scores from the survey for each question related to Kansei Engineering, it will be used in the main survey phase. A second survey was conducted to collect data on customer thought and opinions regarding the products selected in the presurvey. To analyse the results in the second survey, use the SPSS software to find correlations between the two variables. Successful results were obtained, by using morphological chat to construct 3 concept design for new design of the air freshener casing. Overall, Kansei engineering is one of the methods that can be used to obtain user or customer opinions as well as thought to be transformed into new designs that suit the customer's demand.

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i

ABSTRAK

Kebanyakan konsep reka bentuk yang terdapat di pasaran datangnya daripada idea pereka yang kadangkala mempunyai pendapat yang bertentangan dengan definisi konsep reka bentuk tersuai dan akibatnya ia sentiasa mengelirukan. Tujuan penyelidikan ini dijalankan adalah untuk menambah baik reka bentuk selongsong penyegar udara yang memenuhi permintaan pelanggan dengan menggunakan Kansei Engineering. Kansei Engineering ialah alat yang digunakan untuk mentafsir perasaan dan pendapat manusia daripada pengguna atau pelanggan ke dalam parameter reka bentuk. Hasil kajian ini adalah reka bentuk selongsong penyegar udara, yang memenuhi perasaan psikologi pelanggan. Merujuk kepada objektif utama dalam penyelidikan ini, tiga objektif telah dicadangkan. Pertama, untuk mengkaji kejuruteraan Kansei dan model Kano dalam reka bentuk produk sarung penyegar udara. Objektif kedua adalah untuk menganalisis data menggunakan soal selidik dengan mengaplikasikan penyematan perkataan Kansei dengan model Kano. Objektif akhir kajian ini adalah untuk membangunkan prototaip 3D reka bentuk penyegar udara menggunakan kejuruteraan Kansei (emosi) yang dibenamkan dengan model Kano (kepuasan). Tinjauan Kansei terdiri daripada dua bahagian. Pada bahagian pertama, pra-kaji selidik telah dijalankan untuk mengumpul data tentang pilihan pelanggan terhadap produk penyegar udara yang terdapat di pasaran. Dengan merujuk kepada markah tertinggi daripada tinjauan bagi setiap soalan berkaitan Kejuruteraan Kansei, ia akan digunakan dalam fasa tinjauan utama. Tinjauan kedua telah dijalankan untuk mengumpul data tentang pemikiran dan pendapat pelanggan mengenai produk yang dipilih dalam pra-kaji selidik. Untuk menganalisis keputusan dalam tinjauan kedua, gunakan perisian SPSS untuk mencari korelasi antara dua pembolehubah. Keputusan yang berjaya diperolehi, dengan menggunakan sembang morfologi untuk membina 3 reka bentuk konsep untuk reka bentuk baharu selongsong penyegar udara. Secara keseluruhannya, kejuruteraan Kansei merupakan salah satu kaedah yang boleh digunakan untuk mendapatkan pendapat pengguna atau pelanggan serta difikirkan untuk diubah menjadi reka bentuk baharu yang sesuai dengan permintaan pelanggan.

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CHAPTER 1

INTRODUCTION

1.1 Background

In the few years ago before industry know about how getting customers satisfaction, usually designer will do the design by thinking it themselves. Sometime the design quite often does not usually meet great approval in the market. Furthermore, product designers are struggling searching to get a greater understanding of the individual feelings of users. In term of innovative product growth, the modern era is moving from a product-out to a market-in approach. It amplifies the user's needs to the same level as the other technical requirements of a good business marketing (A. M. Lokman, 2009). Consumer satisfaction is described as a consumer's attitudes, research, and emotional reaction after a purchase based on a combination of a product's actual output feeling with the hope and evaluation experience of purchasing a product. Apart from that, company royalty is often a mentality and consumers' attachment, or belief based on feelings of enjoyment, popularity, and proud in being a customer of the famous brand. (A. M. Lokman & Aziz, 2010)

It is difficult to estimate implied demand because users' feelings are more difficult to quantify than over needs, which are easier to explain. Kansei engineering is a method that can used to evaluate feeling and impression of customers about a product (Schütte et al., 2004). Kansei engineering was invented by Nagamachi at Hiroshima University about 30 years ago, for a new product development (Matsubara & Nagamachi, 1997). Kansei engineering method can interpret customer's feeling and opinion into a data set that make easier to product designer know well about customer's demand. The aim in this method is to get customers' opinion about existing product then produce new design or new product in market (Nagamachi, 1999).

Many product that applies Kansei engineering were sold well in Japan(A. Lokman, 2010). With this method become a main aim of research to collect customer's opinion or feeling about the design of automatic spray air freshener. Most of the house, office, and hotels in Malaysia have air freshener. The main purpose air freshener place in enclosure room such as kitchen, living room and bedroom is to reduce the unpleasant odor in house (Alshaer et al., 2019). There have many types of air freshener can be use such as spray, gel form and evaporative diffuser. Most of the user prefer an attractive design for air freshener as decoration. So far, there has not been a version of an automatic air freshener that uses the Kansei approach based on current literature. So, this research is performed to evaluate the users emotional then transfer it into the design elements combined with emotion influence to improve an automatic air freshener. Figure 1.1 shows the concept of Kansei Engineering generally.

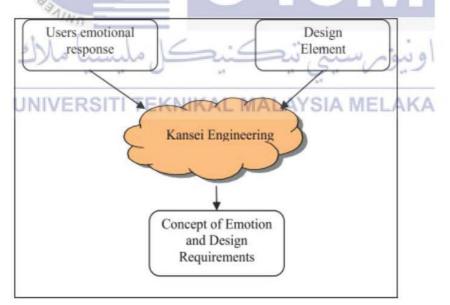


Figure 1.1 Concept of Kansei Engineeering (Nagamachi, 2003).

1.2 Problem Statement

There have several techniques can be applied to improve product as well as sell Kansei engineering is one of them. Moreover, Kansei Engineering is not a popular method used in Malaysia.

Air freshener is one of essential need in every house. Users look for appearance of casing air freshener then the scents. Most air freshener existing in market do not have an attractive design. Design that seller produce does not have decoration friendly. The production more focus on function of the air freshener. Some users need a new design of air freshener that can fit their interior decoration.

To find out the suitable product for users, should be given opportunity for users to select their own desire design for air freshener by applying Kansei engineering element during the survey. In addition, the product development of air freshener casing also will be referring customers opinion and feelings. Usually, designer or home fragrance manufacturer do not focus on the outer design but the smell of fragrance.

1.3 Research Objective

1/NO

In this research have three main objectives need to be achieve at the end of this research:

 To study on Kansei engineering and Kano model in air freshener's casing product design.

- To analyze data using questionnaires by applying Kansei word embedding with Kano model
- To develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction).

3

1.4 Scope of Research

This research is mainly to study Kansei engineering and Kano model method in order to improve existing product which is air freshener casing. So, in the end of this research the acceptable design and decoration friendly of outer casing for air freshener.

Relation between customer's desire, feeling and judgement with the product will be study further about Kansei Engineering in product development. As to collect the selected sample from users that related to domain product air freshener is using google from. Same as data collection for sentiment survey is using google form. Result from sentiment survey will analyze using SPSS software to getting the correlation between adjective opinion to the product.

Designing air freshener casing that have attractive appearance without change the function and relevant. Solidwork is applied when getting finalize relevant design for new design. Finally, running final survey about getting the opinions from users.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, will be discussing about the literature review studies. It will explain the summary based on previous study that has a better experience. Besides, the basic theory that has relations with research that will be explained regarding the basic theory that has connections with research that would be done from textbooks and other resources is discussed in a literature review. The purpose of this chapter is to find out the difference between previous study with the research that would be conducted.

2.2 Consumers Demand in Product Development

Consumers are the most important factor in the development of new products and determining product success requires an awareness of customer desires. Consumer interest in product growth, on the other hand, does not necessarily provide the desired results; however, contact with customers may mitigate the unexpected and generate foresight to help address potential consumer needs (Booz, 1982). Customer orientation is critical for a market orientation approach, and different approaches have been used to determine consumer needs. Nonetheless, a competitive economy with a large number of customers necessitates special measures to comprehend customer demand for new product growth.

New Product Development (NPD) refers to a company's operations that result in a continuous stream of new or modified product retail offerings over time. This includes the creation of opportunities, their collection and transformation into objects (manufactured products) and activities (services) for customers, as well as improving institutionalization of

new product development activities (Bangad, 2010). Successful innovative technologies are a critical component to a company's development and productivity. And so, not all new products can succeed on the business; for example, the probability of a new product loss is balanced against the potential for economic growth.

Even though the risk is embedded in new product development, it can be quantified by using a formal method for handling new product behaviors. Figure 2.1 illustrates the Booz, Allen and Hamilton's New Product Process, which separates new product creation into seven stages: Idea generation, screening and evaluation, business analysis, development, testing, and commercialization are all steps in the development of a new product strategy (Booz, 1982).

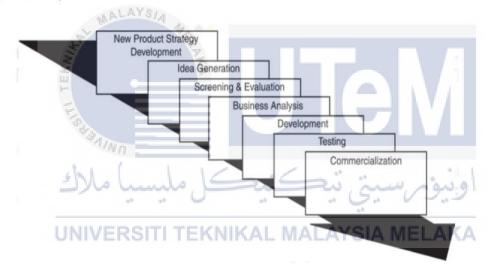


Figure 2.1 New Product Process (Booz, 1982).

In the first stage is new product development. Creating the framework for the new product development process by evaluating missions and related objectives, as well as identifying roles that new products could play in achieving specific goals. This material highlights the strategic needs for new product as a guide for following stages of product innovation. Generate the idea is the second step in the process of developing a new product. In order to discover a suitable and useful concept, an organization would usually produce a lot of them. The most creative companies also use a variety of sources of inspiration from emerging products, as well as a variety of methods to process such ideas. They must also boost employee ingenuity in order to operate the pipeline that feeds innovative product design and production(Bangad, 2010).

Idea screening is the following step after getting the list of idea. In this stage This is the first evaluation of a modern product concept. It entails filtering new product concepts in order to identify the best ones and exclude the bad ones as quickly as possible. Only concept concepts that will turn into useful goods are used in this process. The concept of development and testing. At this point, the product concept is transformed into a verbal or visual representation, with initial ideas for impediments, products, and technologies. Furthermore, emerging design ideas were checked with prototypes of potential audiences in idea testing to see whether they had a good impact on them.

Marketing strategy and business analysis is involves developing an initial marketing plan for a new product based on the product idea. The marketing campaign statements are split into three sections which are an overview of the target market, the expected product placement, as well as revenue, market share, and benefit (Booz, 1982). This provides a study of new product revenue, prices, and earnings estimates in order to determine if these aspects meet the firm's goals.

Product development phase in this phase it involves the assembly of all the component and other works that related (Booz, 1982). It will transform into tangible shape and samples in this section to ensure that the product theory can be turned into an actual product.

Marketing testing is the process when the product prototype and marketing division was simulated in a more practical and real-time business scheme at this point of new product growth.

Commercialization is the final stage. This section simply refers to the launch of a new product into the industry using some campaign advertising tactic. A new product may be sold quickly, exclusively, or carefully in order to promote it(Bangad, 2010).

2.2.1 Kansei Engineering

Kansei Engineering (KE) is one of method product development process which related to consumer emotion and opinion. By referring to Japanese word Kansei means consumer's emotional feeling and image about a product(Nagamachi, 2003). Kansei Engineering is mostly used as a catalyst for the systemic development of new and creative ideas, but it can also be used to enhance current products and concepts (Zhabiz Shafieyoun, 2014) . The study of product emotion has shown that emotional design outshines useful and usable design. Figure 2.2 shows the Kansei Engineering system(Neto, 2015).

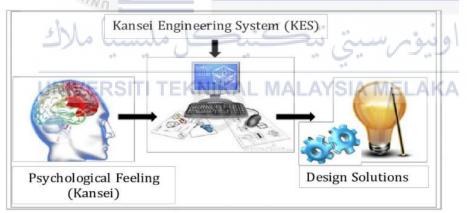


Figure 2. 2 The Kansei Engineering System (Neto, 2015).

The idea for a new product can be design according to customer's feeling and image by applying Kansei Engineering technology. According to the definition of Kansei 8 Engineering from Nagamachi " translating technology of a consumer's feeling (Kansei in Japanese) of the product to the design elements (Nagamachi, 1999). Kansei Engineering is an evaluation about some product in form of subjective comment or perception by referring to the interaction between the purpose or experience. In total, Kansei Engineering (KE) has become a strong product and service design technique that collects and converts potential users' and customers' emotional demands and sentiments into customer experience design features and features.

2.3.1 Definition of Kansei

In Japanese culture, the word Kansei is difficult to translate to the other language. Kansei is referred to as sensitivity, sensibility, and feeling in certain dictionaries, while having varying meanings from different literature, including sensitivity, meaning, sensibility, feeling, aesthetic, sentiment, love, and intuition in English(Neto, 2015).

In term psychology, Kansei can be define as the mental state this is knowledge, emotion, and sentiment are synchronized. Those people who rich Kansei is people full of emotion and sentiment adaptive as well as warm and responsive. The closest word to Kansei is 'psychology feeling' people have with a product. Emotion is described in its psychological school of thinking as unconscious thoughts about objects, and this definition is similar to the Kansei principle.

The change of era there have revolution in design in some industry like fashion, decoration, building and etcetera. So, Kansei is reflection of the era and change occasionally such as trend related. Furthermore, differences in Kansei can occur as a result of differences in culture and social behavior between individuals and nations, and there are Kansei that are nearly identical but vary in terms of the Kansei words represented. As a result, when

applying K.E. abroad, topics such as culture and timeliness are some of the sensitive matters that must be considered.

2.3.2 Kansei Engineering Invention

Professor Misuto Nagamachi of Hiroshima University invented the system in Japan in the early 1970's, as a consumer-oriented technology for new product development and it has since been applied by a lot of Japanese firms (Nagamachi, 2003). The method became popular in the United States and Europe in the mid-1990's. Kansei Engineering has

progressed significantly in its three decades of existence.

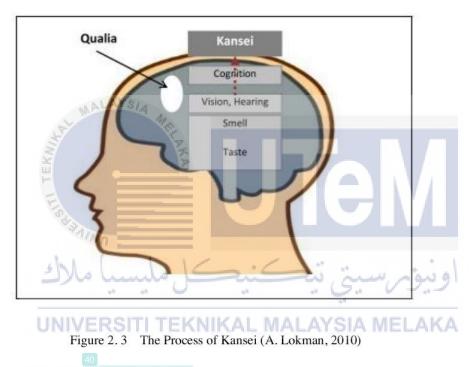
Nowadays, many products were invented by using Kansei Engineering technology method. As a great example, a Japanese automotive manufacturer, Mazda using Kansei Engineering to develop a new sports car named "Mitaya'.

The main purpose of Kansei Engineering to innovate and produced a new product based on the feelings and demands of customers. To proceed with this method there have four points that concerning(Nagamachi, 2003). First, to understand the customer's feelings (Kansei) regarding the goods in terms of economic and psychological evaluation. Second is how to figure out the product's design features from the Kansei of the customer. Third is how to make Kansei Engineering a user-friendly technology. Lastly, what to do to adapt product

design to contemporary cultural shifts or consumer preferences

2.3.3 Kansei Mechanism

Kansei refers to the psychological state in which knowledge, feeling, and sentiment are in balance. Kansei as a mental function, most exactly as a deeper mental function according to Harada (Anitawati, 2009). As a result, it is an implicit function of the brain. Kansei begins with the five senses acquiring sensory functions such as sensations, emotions, and intuition (i.e., vision, hearing, smell, taste, and skin sensation). Psychological brain function involving perception, judgement, and memory will emerge when these senses are aroused. In the case of entering a new boutique, your senses of sight, smell, fashion style, and cognition would determine if the establishment were "very welcoming" or provides "excellent service ". Figure 2.3 shows the process of Kansei in form of brain sensory (A. Lokman, 2010).



2.3.4 Concept of Kansei Engineering

Kansei Engineering attempts to develop a modern product focused on the feelings and demands of consumers. Kansei can be explained using the human brain as a model and our brain creates interest, feelings, and emotion, which are known as Kansei. Regarding this method, there are four things to consider which is, first is how to grasp the consumer's feeling about the product in term of psychological estimation. Second, the way to identify and analyze the product's design feature from the Kansei of the customer. Third, how to build Kansei Engineering as an ergonomic and update technology. Lastly, fourth is how to adapt product design to new cultural changes or consumer preferences. Figure 2.4 shows Concept of Kansei Engineering (Chuah et al., 2008).

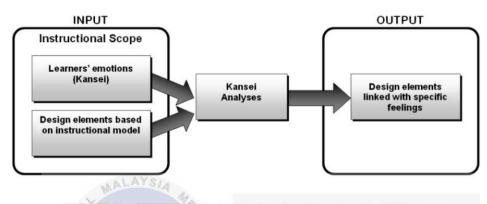


Figure 2.4 Concept of Kansei Engineering (Chuah et al., 2008).

2.3.5 Type of Kansei

Nagamachi discovered six different varieties of Kansei Engineering procedures have now been checked and are ready for use (Neto, 2015). Table 2.1 below show the type of Kansei Engineering that currently available.

Table 2.1 Type of Kansei Engineering	System (Anitawati, 2009)
ruble 2. I Type of Rubber Engineering	System (Immawan, 2007)

Туре	Type Name	Description
I	Category classification	• Identifying the design elements of the product to
		be developed, translated from consumer's feelings and image.
II	Kansei Engineering System	• A computer aided system with a so-called
		interference engine and Kansei databases.

		14
ш	Kansei Engineering	• Mathematical modelling with an interference
	modelling	engine and databases
IV	Hybrid Kansei Engineering	• The combined computer system or forward
	System	Kansei, which goes from the user's impressions
3		to design specifications and vice versa.
V	Virtual Kansei Engineering	• An integration of virtual reality technology and
		Kansei Engineering in a computer system
VI	Collaborative Kansei	• Group work design system utilizing intelligent
	Engineering Designing	software and databases over the internet

ALAYSIA

Kansei Engineering's future development and application to other areas would necessarily require the integration of more technologies and approaches from other fields. Kansei Engineering's future development and application to other areas would require integrating more technologies and approaches from other fields. This might be key to Kansei Engineering's growth.

2.3.6 Application of Kansei Engineering in Product Development

1. Automotive vehicle design. (Type 1 KE)

Japanese automotive manufacturers wanted to implement Kansei Engineering into The production of automotive vehicles. Nissan, Mazda, and Mitsubishi were ready to apply Kansei Engineering and started producing a variety of newly designed vehicles. Nissan has extended the latest ergonomic technology to all new products. Kansei Engineering was first developed by Mazda for the creation of "Persona" and later for "Miyata". In addition, Mitsubishi practiced Kansei Engineering before any other automobile manufacturer and decided to apply it in the "Diamante," which would have been a success. Toyota and Honda, several other Japanese manufacturers, were also interested in learning about Kansei Engineering Type I and then used it to develop their products. Figure 2.3 shows example translation of Kansei into car physical trade (Nagamachi, 2003).

	Kansei		_				Physical	Automotive	
Zero	lst	21	nd		1	uth	traits	expriment	engineering
1	- Tight feeling	-		•	•	•	Size Width	Tight feeling experiment	Chassis design Sheet design
		_	•	٠	٠	•	Height	Interior kansei	Interior design
нми-	Direct feeling -	F	•	•	•	٠	Seat Steering	experiment Steering	Power train development
1		L	•	•	٠	•	design	function	Steering yaw ratio
	Speedy feeling -	T's	i.	Ċ	·		Shift lever Speed meter	Shift lever length	Steering design Shift lever design
	MA			1		•	Frequency	Minus gravity	Speed meter design
E	Communication	T		1	Ŷ	Ċ	Open style	Noise frequency analysis	exhaust pipe design

2. Computer assisted KE. (Type II)

The Kansei Engineering is a computerized system that uses the expert system to convert the feeling and image of the customer to the design data. It can be related to Kansei Engineering type II which is is a computer supporting system for designer's

designing Kansei product. Figure 2.5 below show the four database of computerized KE system (Nagamachi, 1999).

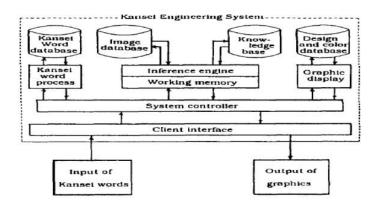


Figure 2.6 Flow Kansei type ii (Nagamachi, 1999)

Type II Kansei Engineering has been used to create a costume for a college girl, house design, entrance door design, car interior design in Nissan, office chair design, the color planning, interior design in a construction machine, and automatic door design. Knowledge computing tools used by the KES include Expert Systems, Neural Networks, and Genetic Algorithms. Whenever a designer enters his or her Kansei terms into the scheme, the KES calculates them using the inference engine and databases, and then displays a graphic as the result of the calculation.

3. Mathematical modelling (Type III)

Fukushima and his colleagues explain the Type III case in detail. They managed to introduce intelligence into a color printer in order to create a better color image. They performed an experiment in which the participants used the Kansei SD (Semantic differential) scales to rate different girl's face skin colors (Nagamachi, 1999). Figure 2.7 shows example semantic differential scale (Tama et al., 2015). The tested colors were divided into three categories: shade, value, and chroma, which were then represented using a triangle fuzzy membership function. Using the SD scale, we performed an ergonomic study on face color analysis. We succeeded in Kansei realization of making more balanced and beautiful color copy implementing the face color tuning method in the CPU of the new color copy machine. Nagamachi also used a Fuzzy Logic system to model Japanese term feeling (Nagamachi, 1999).

NEGATIVE	1	2	3	4	5	POSITIVE
Affordable, inexpensive						Expensive
Antique, classic						Modern, contemporary
Plain						Patterned
Dull				1		Attractive
Ugly						Beautiful
Uncreative				1	1	Creative, innovative
Not harmonious						Harmonious
Inclusive						Exclusive
Complex						Simple
Not appealing				Ĵ.		Appealing, dazzling
Not Aesthetics						Aesthetics
Not inspiring				1		Inspiring
Untidy						Tidy
Rigid	_			1	-	Dynamic
Common						Limited edition

Figure 2.7 Semantic Differential Scale (Tama et al., 2015)

2.3.7 Kansei Principal

The literature shows that K.E.'s process explanation is mostly summary. Figure 2.8 below shows the outline for principle of KE implementation that is possible in all development cycle for different kinds of product (Anitawati, 2009).

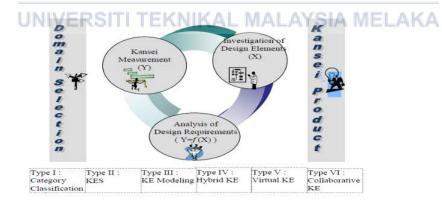


Figure 2.8 Principal of KE (Anitawati, 2009)

In a particular domain, the approach involved the phases of Kansei Measurement, Investigation of Design Elements, and Analysis of Design Requirements, with the aim of producing Kansei products (Anitawati, 2009). At the bottom, various categories of K.E. are arranged to display different types of K.E. techniques. Below states the detail of each component from the main principal.

First, domain product selection during this process, identifying the specific domain product that need to be study using Kansei Engineering technique. Since Kansei answer is unique for different products, it is limited a study to a single domain. As stated above there are six types of KE. Any kind of K.E. to use is determined by the industry's or Kansei Engineer's strategies for completing all processes (Schütte et al., 2004). M.Huang, H.Tsai and T.Huang (2011) applied Delphi method to making a decision by avoiding predicted erroe as well as less arguments (Huang et al., 2011).

Second is collection of Kansei word. The Kansei word applies to describe the product domain. These words are mostly adjectives, but they may also take other grammatical forms but also verbs and noun can occur. All relevant references must be used to obtain a full set of terms, even though the words that occur appear to be related or identical. Figure 2.9 below represent sample flow of selection Kansei word (Schütte et al., 2004).

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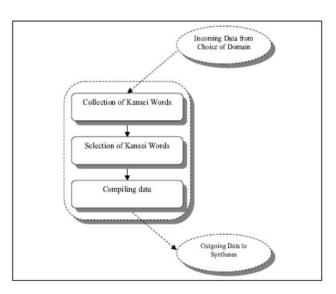


Figure 2.9 Simple Flow of Selection Kansei word (Schütte et al., 2004).

The number of existing Kansei terms ranges between 50 and 600, depending on the domain in question. Since it is critical to compile all existing words, the process is repeated until no new words appear. If key words are omitted from the report, it would have a significant impact on the quality of the findings.

The third principle is measuring Kansei. The method of capturing a consumer's internal feeling is known as Kansei Measurement. It is difficult to calculate Kansei explicitly since it is subjective, complex, and unstructured. As a result, we must formulate indirect calculation approaches based on a different speech methodology. The list above is sorted according to the complexity of behavioural patterns. Kansei Engineering is focused on analytical product and model property estimations, and it assists consumers in expressing their expectations on items they may not be aware of. As a result, semantic methods such as Osgood et al (1969).'s Semantic Differential Method are used (Schütte et al., 2004).

Forth is collection and selection of product properties. Manual compilation and selection of product features from many products that available in market by the product

designer alone is the most common variant in any designing phase. Functional supports, such as fish-bone diagrams, may be helpful in complicated situations.

Fifth, investigation of Design Element. The method of examining basic design elements such as color, scale, and form of a product is known as investigation of design elements. From a customer perspective about the design concepts must be categorized into their values (Anitawati, 2009).

Sixth is analysis of Design. Most crucial in creating and maintaining a quality Kansei of product are psychological reaction to product design features. This method determines which Kansei is strongly linked to the product design elements in order to decide the design criteria for developing a product that incorporates the target Kansei. Many tools are available to do a data synthesis regarding qualitative and quantitative data. One of the tools can be used to study the data is Minitab application. By using this application, from the data collection can be analyze through linear regression, find the correlation and the standard deviation.

Lastly, model building. The collected data from the simulation can be presented as a model until the validity tests have yielded a satisfying result. Sketching part is the most crucial part as it need to draw the new product by following features have been chosen by users. In 3D modeling, it is suitable to used application Solidwork to draft. And not only one drawing it can be more than one. In previous study, there prepared six sample of drawing to be proposed by expert (Huang et al., 2011).

2.2.2 Data Collection

Usually manually data collection is most common variant for every designing process. But the most quality result for data collection have been done by the expert designer which has may experience that can decide which product that suitable by referring to the parameter will have taken out. Many ways for the designer collect data in this case is Kansei data.

Table 2.2 shows the list of data collected ways from previous study.

Bill	Торіс	Data collection method
1	Improvise the design of ceramic	Data collection done by distributing
	souvenir to meet customers	questionnaires among people in public places
	desire	(Tama et al., 2015).
2	Commercial trade show booth	Using Delphi method to achieve multi-
	design for plastic and rubber	opinion in making decision as well as
	industry.	avoiding predicted error and arguments
	EKNIN	(Huang et al., 2011).
3	Systematically emotional design method of products', it also can	Clarify Kansei image word that reflected emotional from user. Distribute questionnaire
	be used to design mini digital	to target users (Guo et al., 2014). The researcher using 5-point SD scheme.
4	A walking stick as an older UNIVERSITI TEKI Japanese people	The method used is Kansei sheet, read body NKAL MALAY SIA MELAKA language and interview the old Japanese
	5	people (Elokla & Hirai, 2015).
5	Design for packaging design of	Kansei word were collected from books,
	powder shape freshener	journal, internet etc. then minimizing the
		Kansei word. Finally become as strategies of
1		design product based on KW which is answer

 Table 2. 2
 List of data collection methods

	61	in first objective paper (Djatna & Kurniati,
		in first objective paper (Djatna & Rufflatt,
		2015).
23		
6	Design in innovative alarm clock	First find the respondent that agree with the
	made from bamboo	innovation. Kansei words were collected from
		25 respondent by questionnaire (Achmad
		Shergiana, 2015).
7	Developing a new jeans design	From the image sample the designer group
		and selected Kansei word from image jeans
		drawing (Nagamachi et al., 1959).
8	Designing comprehensive ball	The study collected 27 sample of ball pens
	pen yelaysia	come from different companies. The 24-
	AND NO.	respondent female student using 5-point SD
		scale measurement to evaluate each pen and
	The second second second second second second second second second second second second second second second se	consist of 40 Kansei words (Nishino, 2010).
9	Kansei engineering approach for	The samples were collected from all type of
	consumer 's perception of the	product from different company. 8 type of
	ketchup sauce bottle	different sauce bottle with the different shape
	UNIVERSITI TEKI	and function used (Mamaghani et al., 2014).

From the table above, as conclusion many ways that can be used to collect the data from respondent. There has direct interview with the respondent, questionnaire distribution and using Kansei sheet and reading body language. The method also depends on the product study. The better method nowadays is 5-points SD scheme. And distribute using google form so can getting more respondent to ensure the data is more accurate.

2.2.3 Data Analysis Method

In systhesis data or data anlysis, the subjective or Kansei word and product design must link together. The product properties must affect the Kansei word. Nagamachi's work with Kansei Engineering over the last five years has focused on building these ties. There are a variety of quantitative tools accessible at the moment. Table 2.3 shows method tht have been used from previous study.

Bill	Topic	Method
1	Improvise the design of ceramic souvenir to meet customers desire	Data is processed for factor analysis and conjoint analysis using SPSS19.0
	TERMIN TERMIN	Kansei word.Conjoint analysis used to find the relationship between Kansei word and the design element. (Tama et al., 2015)
2	Commercial trade show booth design for plastic and rubber industry.	To evaluate the trade shoe design with using fuzzy synthetic assessment method. It conduct assessment of many target using many influence on sample (Huang et al., 2011). The evaluation involved 4 parts : 1. Cluster generation (to assemble) 2. Cluster weighting factors (design parameter) 3. Aim to optimize the sample of all factors 4. Perform fuzzy evaluation.

 Table 2.3
 Methodology used in previous study

3	Systematically emotional	The data is evaluated by using MDS in SPSS
	design method of	18.0 it also includes RSQ (squard correlation).
	products', it also can be	To estimate value between the computed result
	used to design mini digital	and observation data, stress value need in
	camera	smaller value. For better result, stress value
		need in lower value (Guo et al., 2014).
4	A walking stick as an	In the study of emotion, the evaluation more
	older Japanese people	referring to the user emotion through walking
		stick by Kansei sheet as well as the interviews
	G ALAYO,	revealed the emotions (Elokla & Hirai, 2015).
5	Design for packaging	Quantification theory type 1 (QTT1) is used by
	design of powder shape	Djatna and Taufik (2015) to evaluate the result.
	freshener	This method is known as quantitative and
	LINE .	categirical multiple regression analysis method.
6	Design in innovative alarm	To analyses the innovation alarm clock is used
	clock made from bamboo	Stuart Maxwell test. This test is to know the
	14 14	significant between user need and innovative
	UNIVERSITI T	alarm clock. As a result, customers criteria at
		5% of significant level about the innovative
		alarm clock (Achmad Shergiana, 2015).
7	Developing a new jeans	Analysis data is done by using Viramax method.
	design	This method shows that cumulative contribution
		from several factor which is from Kansei word
		(Nagamachi et al., 1959).
1	1	

8	Designing comprehensive	Multiple linear regression analysis is used to
	ball pen	analyze the data from questionnaire. Ninshio
		(2010) was proposed multi-level rule extraction
		method for designing to match with Kansei goal
		and development concepts in Kansei
		Engineering.
9	Kansei engineering	In this research used statical tool Kaiser-Meyer-
	approach for consumer ' s	⁶ Olkin (KMO) measure of sample adequacy and
	perception of the ketchup	Bartlett's Test of sphericity. KMO statistic
	sauce bottle	should be 0.6 or greater. Bartlett's Test has a p-
	WALAYSIA 4	value less than 0, 0001 showing that there are
		significant bivariate correlations between some
	<u> </u>	of the variables (Mamaghani et al., 2014).

As the table 2.3 shows many methods have been used to analyze data from questionnaire. Nagamachi state that in Kansei research statistical method based on mathematical and nonmathematical approaches have been proposed but it depends on the research context. At present, many applications can be used to analyzed data without difficulty. Minitab is a software that provide an effective way to manipulate data, getting trends and patterns, and conclude answers about current issue. Linear correlation is one of the statistical measure techniques that define the linear of relationship between two quantitative variables. Correlation simply writes as r. The value interval between +1 and -1. If the value is 0 that

means, there no relationship.

2.2.4 Literature Study

By referring to the journal with title Development of Customer Oriented Product Design Using Kansei Engineering and Kano Model: Case Study of Ceramic Souvenir Study by Tama, Ishardita Pambudi, Azlia, Wifqi, Hardiningtyas and Dewi the main purpose conducting this research is to enhance the design of ceramic items by researching what consumers desire about ceramic items. In order to meet customer needs, in order to attract the best shoppers' interest. In this study researcher has been apply Kansei Engineering Type I -Category Classification to create ceramics for souvenir items. Following that, the significant Kansei words that influence customer happiness will become design priority for development plans. In order to collect the data, it was distributed a questionnaire with a 5point SD scale score and 20 Kansei words that represented users' emotional responses. The sample size for this research is 40 people. Respondents' personal information and reactions to each graphical sample of ceramic design were included into the questionnaire. Furthermore, this study classifies or categorises Kansei terms from customer choice into Kano Model attributes and maps them into three kinds of customer satisfaction. After that, assisted with the math calculation and statistical analysis. One of the efforts that can be taken to deal with the increasingly competition is through product design. Due to the fact that the appearance of a product is likely to be the initial impression made by buyers, its attraction cannot be separated from its appearance. The aesthetic worth or attractiveness of an item's display is strongly linked to its ability to grab the attention of potential consumers. The result shows that preferred souvenir is a drinking mug / cup with basic parabolic-shaped design, artificial exploration with 2D and textured glaze decoration, as well as coloured blocks (Tama et al., 2015).

This research with title Applying Kansei Engineering to Industrial Machinery Trade Show Booth Design was carried out to assist machinery suppliers by providing a systematic design flow chart and associated criteria for trade show booth planning. This study describes a multiple factor decision-making strategy for trade show design while looking at open days in the plastics and rubber industries. The suggested approach is divided into three sections: (1) Using the Delphi method and Kansei engineering, select acceptable assessment criteria for trade show design., (2) defining acceptable concepts and techniques for booth design for trade exhibitions in the plastics and rubber industries that use fuzzy product placement, (3) improving trade booth design to achieve trade show involvement goals. These professionals interact using the Delphi technique to create assessment criteria for booth design and elements for valuing the aims of trade show participation. Second, to develop picture word datum for describing trade show design, this study uses category categorization. These experts are expected to develop assessment criteria for trade show design, identify samples of good booth design, and verify new design cases. Data used in sample selection by experts are based on 116 sets of booths. The first three highest scores are identified as examples of good booth design. Then the most important task to survey customers preferences using Kansei Engineering. Based on this image word data, experts choose appropriate adjectives to describe trade show design. This study applied the fuzzy synthetic evaluation approach. For the advance assessment, 30 interviewees that divided into two groups including 15 members with mechanical engineering experience and other 15 members with product design experience. These two groups have significance in order to design booth. To summaries the analysis of six samples by 30 interviewees it states that the attributes in designing trade booth are 'very modern', 'simple', 'professional' and 'scientific'; those describing lighting include 'very bright'; and those describing functionality include 'practical', 'convenient', 'comfortable', and 'clean' (Huang et al., 2011).

Emotional Design Method of Product Presented in Multi-Dimensional Variables Based on Kansei Engineering, this journal study presents a Kansei Engineering based systematically emotionally design process for product hard interactions, which may be developed to generate a product that mirrors customers' feelings. Therefore, it is of high necessity to study users' emotional needs aroused by the product's multi-dimensional design variables. The KE models are built using typical paired Kansei image words and multidimensional key design factors acquired using consumer-oriented methodologies. It may be utilised in a variety of design situations to improve the emotional design of a product. The key in technologies and methods of product design, which included Kansei images, describing the product form, identifying form design variables, establishing relationships between Kansei images and the design variables, and developing the product intelligent design. The request study of the target user for the study item is the first step in the KE-based product design. This phase requires collecting as many samples of the research object as possible, and then determining many with various appearance features that may be applied in the next phase after objectives are clearly by a target population. Secondly, certain important Kansei image words are selected out based on the three which was before criteria and the frequency in which users use the words to assess the study item. Third, a questionnaire experiment is used to determine how similar they are. Following the assessment, an averaged comparable matrix was obtained, which MDS in SPSS 18.0 could process RSQ (squared correlation) values in various dimensions. So, the result in this paper is a new mini digital camera have been chosen by decode the binary code. In this paper, there were two disadvantages. First, the research participants were a select group of undergraduates ranging in age from 20 to 32. Secondly, occupation, race, area, and other variables may all have a significant impact on the outcome (Guo et al., 2014).

Evaluation of Assistive Mobility Product for The Japanese Elderly by The Kansei Sheets by Elokla, Nermin, Hirai, Yasuyuki this study applied emotions design methodologies to evaluate the Kansei demands of the Japanese elderly for individual helper items linked to movement. The current design of a walking stick was reviewed from the perspective of elderly individuals in this investigation. The above research was carried out using two different emotional evaluation methods are Kansei sheets and read body language (RBL) sheets. Several issues with the design of walking sticks were found in this study. It emphasized on the current design of the walking stick and its issues as can be seen by users. To assess users' emotions and highlight the most significant design concerns, three emotional assessment methodologies were applied. Kansei sheets, read body language (RBL) sheets, and interviews are some of the methods used. Two sheets represent approximately a Kansei sheet. The first sheet has 14 different emotional reactions. Sheet #2 has nine physical sensations. Sheets #1 and #2 are used to analyze and assess consumers' interior emotional experiences and conscious bodily responses following product/service contact. The user can choose the image/s that best represent his or her emotional state to a product from the two sheets. The user's emotional and bodily responses are measured using a Likert-type scale on the Kansei sheets. Each level of stick design assessments required subjects to apply kansei sheets. The final question was the overall judgement of stick design (reflective level). The following are the example of evaluating questions for stick designs. Stick appearance/aesthetic evaluation -visceral level (using Kansei sheet # 1): Q.1 What do you feel about handle form? Q.2 What do you feel about foot design form? Stick usability and overall evaluation -behavioural level (using Kansei sheets # 1 and 2): Q.6 What do you think about the usability of the stick handle from ergonomics aspect? The findings of both Kansei sheet #1 and the interviews suggested that the subject feelings were mostly favourable when it came to the stick look. Their feelings were divided into two categories: satisfaction and

attraction. Three factors, according to the research, might be to reason for the variances. The first possibility is that an observer may fail to see a certain sort of user facial expression known as a "micro-expression." Second, the "universal language of emotion" has been labelled facial expressions. Third, the physical signal theory proposes that two channels trigger physical reactions: emotion, which may alter in the body and is projected to the brain, and cognitive, which represents emotion and may be engaged in the brain without being directly prompted by a physiological reaction. At total the design that need in walking stick are unique soft handle, height adjusting stick, small size for storage, light weight material and attractive elegant design (Elokla & Hirai, 2015).

A journal with title A System Analysis and Design for Packaging Design of Powder Shaped Fresheners Based on Kansei Engineering written by Elokla, Nermin, Hirai, Yasuyuki. The primary goal of this study is to satisfy client preferences and increase sales of tea powder products by creating beautiful packaging by using Kansei Engineering. Kansei Engineering contributed to the development of a new developed product by connecting the required product attributes for customer satisfaction. That is a chance to improve the look of packaging concept and package quality, which will therefore lead to enhanced customer demand, enjoyment, and satisfaction. Packaging design may be stated to have a key influence AYSIA MEL in influencing a consumer's choice to buy a product. To be capable of influencing a consumer's decision, a package design that is both interesting and unique was necessary. The research's key objective was to determine the design element of package design, to recognize packaging design on Kansei words, and to develop a new packaging design. With analysis and design, the production system that can improve the efficiency and effectiveness in the system especially in order to produce the packaging design of tea powder by using the Kansei engineering method was produced. In methodology, process system development is the first

stage of the system approach's evaluation. Throughout this step, the goal is to specify factors in the analytic system in terms of the overall user. Utilizing tools like Sybase Power Designer 16.0, analyse and model business processes using BPMN workflow. The research used BPMn to analyse processes and subprocesses in order to derive an overall process flow. The second step in methodology is element identification. In starting to develop a product design is to identify the product design. In this research, we determine the design of a tea powder item in terms of understanding its design features by collecting tea powder product samples. Then third step is identified product element on Kansei word where it can derive from books, internet, journal etc. Next, the evaluation's results were combined applying the quantification theory type 1 (QTT1) approach. The QTT1 may be thought of as a quantitative and category multiple regression analysis approach that allows for the inclusion of categorical and qualitative independent variables. As a result, bright, modern, straightforward, and eyecatching are the four main categories of tea powder package design on Kansei words (Elokla & Hirai, 2015).

By referring to the journal with title Design of Innovative Alarm Clock Made from Bamboo with Kansei Engineering Approach by Achmad Shergian and Taufiq Immawan. The innovation of alarm clock that made from bamboo as the source of sound is the one alternative solution of a declining both products. However, due to the impact of the modern toy development, the traditional toys were declined. Othok-othok toys and alarm clock currently are in the declining phase of sales. As a result, the bamboo alarm clock was developed as an alternative to the declining both items. There are different approaches for designing a product, but Kansei Engineering was employed in this study because it can particularly excavate sentiments from customers, resulting in goods that represent sentiments customers. The questionnaire was divided into three sections: Kansei word identification, physical design specification, and physical design parameter evaluation. These important Kansei should be selected as design specifications in the final design. The survey was performed to find Kansei words until a total of 25 people agreed with the idea. The questionnaire consists of three sections: Kansei word identification, physical design specification, and physical design parameter validation. According to the majority of responses, the chosen object best represents traditional design (traditional, creative, unique, and natural). The revolutionary alarm clock was put to the Stuart Maxwell test of marginal homogeneity. The goal of this experiment was to see if there are any major variations between user needs and innovative alarm clocks. As a conclusion in this research paper state that at a 5% significant level, the design unique alarm clock was valid to fulfil consumer criteria. Traditional design and exquisite design were the two elements that split client choices (Achmad Shergiana, 2015)



Next journal titled Kansei Engineering Approach for Consumer's Perception of The Ketchup Sauce Bottle. Same as another research that used Kansei Engineering the method is same. But the number of respondent and Kansei word only different. There were 31 Kansei words chosen, as well as eight distinct types of sauce bottles with various forms and functions. All of the studies took place in Tehran, and 47 persons were included in the study, with 23 men and 24 women varying ages from 20 to 50. To determine the relationships between product attributes and adjectives, a 5-point semantic differential scale was used. These product samples belonged to seven different food products companies. The data in this research were analysed using SPSS software by multivariate statistical techniques such as factor analysis. As generally, the average Kansei answers for each sample have a welldefined distribution. Quality and statistical tools must be integrated with Kansei engineering. The advantage of factor analysis is that all of the variables included play the same function. It is feasible to group replies with similar meaning using a factor analysis on the replies gathered on a certain questionnaire. This cuts down on the number of indicators needed to describe all the replies. At total, the findings show that five elements shape ketchup sauce container samples: visual, personality, operational, distinctive, and fragile (Mamaghani et al., 2014).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The study conducted by Djatna, Taufik, Wrasiati, Luh Putu, Santosa, Ida Bagus Dharma Yoga with title Balinese Aromatherapy Product Development Based on Kansei Engineering and Customer Personality Type. This product is distinctive and well-known in the market because to the blend of aromatherapy and Balinese culture. To produce a new design idea for a Balinese aromatherapy treatment product, three objectives of this study were offered first is to generate the new design concept of Balinese aromatherapy product using Principal Component Analysis (PCA), second to identify the relevant product design element using Relief method, and lastly to generate the quantification model of aromatherapy product design using Fuzzy Quantification Theory Type 1 (FQTT1). From twelve design aspects selected, 10 suitable design components were developed using the Relief approach. Design support data has been developed from these models to help product designers in making decisions for the new Balinese product design. Kansei Engineering (KE) was selected to synthesis these factors in order to develop Balinese aromatherapy product design in this study. Kansei Words are keywords that indicate a customer's perception, sensation, or picture of a Balinese aromatherapy product in this study. Furthermore, depending on the customer's personality type, recommendations for design element combination and arrangement were made. In this research, three interviewing specialists resulting in a total of twelve Kansei words, which were used to describe a Balinese aromatherapy product. The words were then rated on a Likert scale (7 scale) by 30 customers of the product. The Principal Components Analysis (PCA) approach was used to examine the assessment results. The study used Balinese aromatherapy massage oil to show how Kansei Engineering and FQTT1 analysis were used to aid product designers in creating new product design decisions for each personality type. The extraction of KW obtained using the PCA approach reduced 12 Kansei words to one word, which reflected a new design concept. In summary, the findings revealed that all design specifications for Balinese aromatic products were unique to each personality, with the majority of them proving to be effective as new design standards. A larger degree of worldwide demand may be envisaged if the product development of Bal Indonesian aromatherapy is more closely linked to consumer personality type (Djatna et al., 2015).

Kansei Robotics: Bridging Human Beings and Electronic Gadgets Through Kansei Ingineering written by Kato, Toshikazu. Such an information environment would provide

modest and human friendly manner for users including elderly people. Data assistance services, such as suggestion services, are mostly based on social suggestion, which is based on collaborative filtering of a large number of consumers buying records, which does not account for variances in personal preference. Through subconscious contact with a centralized data environment, this work proposes the notion of Kansei mechanism and its modelling approach through unconscious interaction with electronic gadgets. We can model these relationships by statistical behaviour log analysis. Our basic ideas are one is to find users interested and /or preferred items through observation on his behaviours in present everywhere information environment. Secondly, to automatically build his preference model. Lastly, to apply the model to provide suitable information service in the real world. As mentioned above this paper used Kansei modelling to running the experiment. There have three step which is one, Estimation dominant attributes by adopted conjoint analysis as to find the dominant attributes. All those products were analysed with statistically quantification method. Second, method of recommendation considering dominant attributes. When a consumer stands in front of a digital signage unit, the Smart Shop makes product recommendations based on their preferences. They are suggested by a high-scoring order. Lastly, method of recommendation considering dominant attribute. An experiment ran to compare our implicit Smart Shop approach to the old explicit questionnaire technique. Four male students served as subjects. With five phases, the participant assessed his preference for the five recommended goods. This suggestion phase was done three times, yielding a total of 15 product assessments. Respondent given the questionnaire and needed to evaluate the product base on two answer which is 'like' or 'dislike'. And at last, these findings showed that Smart Shop has achieved implicit estimate of prominent qualities using our technique. Finally, these findings showed that Smart Shop achieved implicit assessment of dominating qualities in three of four respondents using our technique. These also shown that, in the event of predicted dominating qualities by Smart Shop and another by survey that did not fit, modelling by questionnaire satisfied a subject better (Kato, 2013).

In 2010 the study conducted by Nishino Tatsuo titled Kansei Engineering Design of Comprehensive Ball Pen Based on Rough Set Analysis, the researcher discovered consumers' wants, developmental concepts, and design qualities using the suggested hierarchical rough set technique. Therefore, we discovered a variety of appealing design options. As a result of applying three separate decision rule evaluation measures, we discovered many appealing design aspects. Three type of decision rule set are S-S-S (supportive design), E-E-E (unique design) and C-C-C (strong design) Researcher discovered consumers' desires as well as developing concepts and design qualities to actualize customers' desires applying the proposed hierarchical rough set approach. Next, there are 24 female students participated in a Kansei assessment experiment in which they assessed 27 various ball pens using 40 Kansei Word and 5-points SD parameters, including consumer desire and 'attractiveness.' The rough set model proposed in this study is used to derive decision rules for Kansei product design throughout this section. A researcher offers a technique for extracting multi-level decision rules. The technique seeks to connect unspoken client desires, development concepts and design features. The following is the UNIVERSITI TEKNIKAL MALAYSIA MELAKA technique for extracting decisions. Step 1 detects principal combinations axis of the component. The derived evaluation criteria might be interpreted as a customer's desire for product development. Step 2 looks for Kansei word combinations. The evaluation criteria that were obtained might be viewed as alternative development approaches for meeting client needs. Step 3 is to identifies design combinations. The extracted decision rules may be thought of as design qualities that help developers meet their goals. Lastly, we may get design specifications to better fulfil objective Kansei through three steps. As a result, there

have three final concepts for the design attributes which are S-S-S for common decision rule set is advance design, E-E-E represent unique decision rule set is advance and young, and finally C-C-C represent strong decision rule set the design is advance, young and simple (Nishino, 2010).

In year 2013 a journal named Kansei Engineering for e-commerce Sunglasses Selection in Malaysia by Chuan, Ngip Khean, Sivaji, Ashok Shahimin, Mizhanim Mohamad Saad, and Nursyakinah. Based on restricted physical visual design, researcher utilize a methodical application of Kansei engineering to uncover the design aspect that may provide emotional appeal for e-commerce consumers. 30 Kansei word relating to the sunglasses advert descriptions were investigated utilizing multivariate statistical analysis employing the Kansei engineering type I technique with twenty sample products (specimens). The key Kansei Words were identified using Factor Analysis (FA) and Principal Component Analysis (PCA), while Partial Least Square (PLS) analysis was used to find the key design features that correspond to the chosen Kansei words. To perform the evaluating test using the URANUS system to establish a survey website and 75 people (aged 18 to 34) requested to rate Kansei words appeal on a 5-point SD scale for each of our twenty samples. Analysis begins by using Factor Analysis to identify a limited number of elements that will carry a significant amount of weight. The study data were transferred to Principal Component Analysis, and the association between Kansei words and specimens is discovered. PCA's overall contribution is nearly identical to the results of our Factor Analysis. The appropriate Kansei phrases that might express the emotional appeal of our target consumers are selected at this step of Kansei Engineering. The influential design features are determined using Partial Least Square (PLS) Analysis. The Product Classification and data from the Kansei words survey are used to create PLS. A connection is established between the four Kansei words chosen, and the design feature described in the product. The final design element list has two color scheme and the color for the frame are blue, orange or yellow. The feature for frame is either half or thin frame.



2.2.5 Summary of Literature Review

Table 2.4 Summary of literature review.

Method Data analysis Product	of Getting customer Mapping result statistic in Souvenir – Ceramic	Oriented opinions by answering Kano model by using drinking mug	n using questionnaire without SPSS 19.0 software Feature: basic parabolic-	rring and limitation Conjoint analysis - shaped design, artificial	ase Study determined relationship exploration with 2D and	venir between Kansei word and textured glaze decoration, as	design element. well as colored	blocks.	Kansei Interview 15 person Using fuzzy composite The perfect trade show	industrial with mechanical evaluation. booth is described as	de show experience and 15 with "scientific," "modern,"	product design "bright," "clean,"	experience "pleasant,"	Answer 3 survey.	elements in new case design.	n-method Distribute 3 MDS in SPSS 18.0 it also Getting the highest score for	sented in questionnaire for include RSQ(squard mini digital camera	al choosing camera correlation	on Kansei product.	
Title	Development	Customer	Product Design using	Kansei Engineering and	Kano Model: Case Study	of Ceramic Souvenir	K	N	Applying X	engineering to industrial	machinery trade	booth design	41	_A	Y	Emotional design-method	of product presented in	multi-dimensional	variables based on Kansei	Envineering
Author	Tama,	Ishardita	Pambudi	Azlia, Wifqi	Hardiningtyas,	dewi			Huang, Ming Applying	Shyan	Tsai, Hung	Cheng	Huang, Tzu	Hua	38	Guo, Fu	Liu, Wei Lin	Liu, Fan Tao	Wang, Huan	Wang. Tian Bo
Year	2015								2011							2014				
No.	-								7							e				

	Nermin	Mobility Product for the	Interview and read body	Result evaluated from interview and result of	Walking stick feature: Soft handle.
_	Hirai,	Japanese Elderly by the	language		Adjusting height.
-	Yasuyuki	Kansei Sheets	A D M	5	Light weight material
-	Djatna, Taufik	A System Analysis and	Collect Kansei word	Using Quantification	Tea powder packaging:
	Kurniati,	Design for Packaging	from books, journal and	theory type 1 (QTT1)	Bright, modern, simple, and
	Wenny Dwi	Design of Powder Shaped	internet.	A.A.	eye catching.
		Fresheners Based on	Distribute questionnaire	LA	
	64	Kansei Engineering		Ys	
2015 /	Achmad	Design of Innovative	Received agreement	Using Stuart Maxwell test	Alarm clock feature:
-1	Shergian,	Alarm Clock Made from	from 25 respondents		Traditional design (which
	Taufiq	Bamboo with Kansei	who agree with		consist of traditional,
177	Immawan	Engineering Approach	innovation		creative, unique and natural)
		411			and Elegant design (which
					consist of clear, exclusive,
_				10	artistic, and interesting)
2014 1	Mamaghani,	Kansei Engineering	47 respondents answer	Kaiser-Meyer-Olkin	ketchup sauce bottle feature:
	Nasser Koleini	Approach for Consumer'	the question base on	(KMO)	aesthetic, personality,
	Rahimian,	s Perception of the	feeling with actual	measure of sample	operational, unique and
	Elnaz	Ketchup Sauce Bottle	product.	adequacy and Bartlett's	brittle.
100	Mortezaei,	YS		Test of sphericity has	
•1	Seyed-reza	;; ;://		been used	
2015 I	Djatna, Taufik	Balinese Aromatherapy	12 Kansei word are	Principal Component	The development of Bal
-	Wrasiati, Luh	Product Development	getting from	Analysis (PCA), Fuzzy	Indonesian aromatherapy is
	Putu	Based on Kansei	interviewing three	Quantification Theory	
		Engineering	expert of aromatherapy.	Type 1 (FQTT1).	

Bagus Dharma Yoga Kato, Toshikazu Nishino, Tatsuo	sei robotics: Bridging an beings and ronic m gadgets lgh k ansei	respondents by answering questionnaire.		consumer personality type.
oga ato, oshikazu ishino,	sei robotics: Bridging an beings and ronic H gadgets lgh X ansei	answering questionnaire.		
ato, oshikazu ishino, arsuo	sei robottes: Bridging an beings and ronic H gadgets lgh X ansei	questionnaire.		
ato, oshikazu ishino, arsuo	an beings and ronic n gadgets lgh bernesi			
oshikazu ishino, arsuo	an beings and ronic n gadgets 1gh & kansei	The subject is 4 male	statistically quantification	These findings showed that
ishino, arsuo	ronic H gadgets Jgh kansei	students with 5 phases	method.	Smart Shop achieved
ishino, arsuo	lgh X kansei	in 1 evaluation by		implicit assessment of
ishino, arsuo	naering C	preferred 5 items in 3	.1.7	gui
ishino, ateno		times repeated		
ishino, atsuo	TI	evaluation using	č	
ishino, atsuo	T	questionnaire.		
atsuo		Respondent 24 female	Multiple linear regression	Three final concepts for the
	- 200		analysis	design attributes:
		pens. 40 Kansei Word.		
	Set Analysis	It is using 5-points SD		S-S-S - advance design,
	دین ۸L	parameters in		E-E-E - advance and voung.
	<	questionnaire.		
	1/			C-C-C - advance, young and
	λL		26	simple.
Chuan, Ngip	Kansei Engineering for e-	75 respondents (aged	Factor Analysis (FA) and	Two color schemes, The
Khean	Sunglasses	18- 34). 30 Kansei		color frame: blue, orange or
ivaji, Ashok	Malaysia	word.	Analysis (PCA), while	yellow. Frame: half or thin
hahimin,	 A	20 samples of products.	Partial Least Square	frame.
Intimution	ي M		(PLS) analysis.	
and	E		•	
ursvakinah	و:			
	K	40		
	9 (A	40		
	Nishino, Tatsuo Chuan, Ngip Khean Khean Sivaji, Ashok Shahimin, Mohamad Saad, Nursyakinah	Kansei Engineering Design of Comprehensive Ball Pen Based on Rough Set Analysis Kansei Engineering for e- commerce Sunglasses Selection in Malaysia	KanseiEngineeringRespondent24 femaleDesign of Comprehensivestudents.27 vary ballBall Pen Based on Roughpens. 40 Kansei Word.Set AnalysisIt is using 5-points SDparametersinquestionnaire.inRansei Engineering for e-75 respondents (agedcommerceSunglasses18-Selection in Malaysiaword.20 samples of products.	KanseiEngineeringRespondent24femaleMultiple linear regressionDesign of Comprehensivestudents.27 vary ballanalysisBall Pen Based on Roughpens. 40 Kansei Word.It is using 5-points SDanalysisSet Analysisparametersinquestionnaire.Multiple Engineering for e-75 respondents (agedFactor Analysis (FA) andKansei Engineering for e-75 respondents (agedPertor Analysis (PCA), whileSelection in Malaysia20 samples of products.20 samples of products.AnalysisAnalysisPartial Least Square

CHAPTER 3

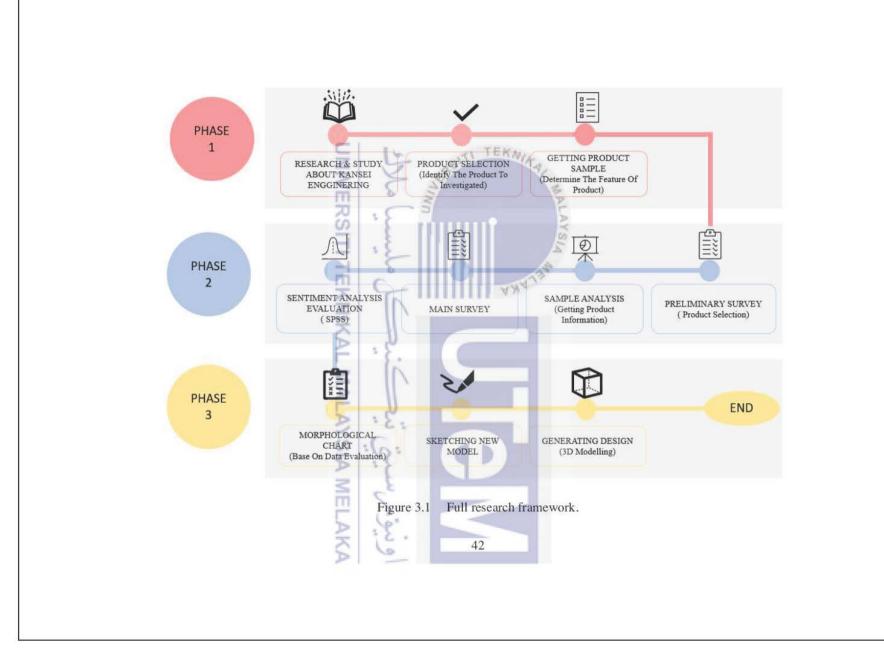
METHODOLOGY

3.1 Introduction

The method in this research work is design to attain the three research objectives. Air freshener has been chosen as a product domain to develop the prototype. In this research paper, three different phase method is followed by the objective. The first phase is study, second phase is analyzing, and the last phase is design. In addition, the research framework and method are representing in Figure 3.1. To ensure the research is accomplish the objective, framework was design in parallel from the initial study about Kansei Engineering, problem statement, objective of the research, methodology, data collection, data analysis, product design, discussion, and conclusion.

The thesis started with the selection of a product domain as the study's topic. Phase 1 is about research study on Kansei Engineering related to product design. This phase is related to the first objective which is to study the Kansei Engineering applied in product design industry. In phase 2, the methodology used is collected data from respondent about how they are felling about the air freshener by looking at it. Furthermore, data analysis is done using Minitab application to find the correlation in creating new design for a product. Moreover, this phase methodology is to achieve the second objective which is to collect data and evaluate result from Kansei Engineering questionnaire. Last phase is phase 3, the procedure is more on designing the new design for the air freshener and get respond from

consumer about the last design. At total, the main idea in this methodology is about planning how to complete this thesis by phase. The work project flow shows in Figure 3.1.



3.2 Phase 1: Understanding Kansei Engineering

In this step is about doing research about Kansei engineering that related to improvising a product design development. The design improvement in Kansei engineering is related with consumer feeling. The first step is identification the main product as the research

object. The summary for first phase is presented in Figure 3.2 below.



Figure 3.2 Framework phase 1

3.2.1 Study on Product Design Development

Afterward, the sample for product domain was collected by internet searching and online shopping website. Moreover, the Kansei word were collected from advertisement through electronic device and customer reviews expressing their sentiment about air freshener from internet as well as social media. There have several types of air fresheners available in market Subsequently, the collected samples were sorted by the type of air freshener which is research only take the automatic air freshener. From this point, the element of the product was classified by component. It is easy to respondent to respond in survey.

3.2.2 Product Design Shortlist

Main product is the product that have been chosen to develop the new design concept by using Kansei engineering approach. For this research air freshener have been chosen as main product. 37 air fresheners have been shortlisted by doing further research about air freshener that available in market. The research is done with internet research method and observation. The research method is done by searching the shopping website as well as some review blog. While observation method done at hypermarket in house scent section. All twelve sample of air freshener then will be listed in Kansei first questionnaire to let consumer pick the most attractive.

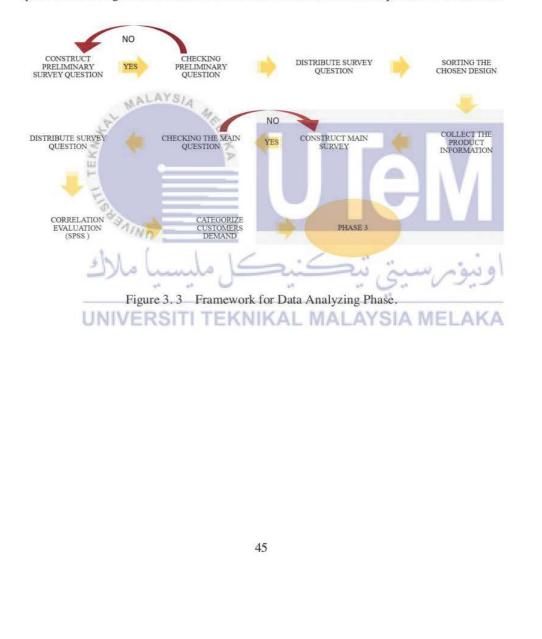
3.2.3 Collecting Kansei Word

Kansei word is the word that can illustrate the consumers feeling and demand. Kansei word is collected which related to the air fresheners. Usually, Kansei word are adjective or a sentence that related to the feeling about the main product. This Kansei word will used in second survey. Seventeen Kansei word was collected from internet journal and review for online shopping website. In Table 3.1 shows Kansei word for air freshener casing that will be used in this research purpose.

TEK	Table 3.	I Kansei word	l for air freshener'	s casing.	
Elegant	Beautiful	Old Fashion	Multicolour	Attractive	Bright
Trendy	Grand	Dual Colour	Stylish	مىتى Ordinary	Simple
Eye Catching	Plain	Modern TI TEKN	Easy Handling	Unique AYSIA MI	ELAKA

3.3 Phase 2: Analyzing Data

In phase 2 to achieve second aim which is data analyzing based on Kansei survey. First thing needs to collect data from user is construct the first questionnaire as known as product selection survey. The questionnaire number one is mostly about getting data of customers choosing the various design of product that available in market and collecting the general information about respondent. It is about twelve design that available in first questionnaire. Figure below is the flow cart for framework in second phase in this research.



3.3.1 Kansei survey

Kansei survey is an analytical assessment of consumers' thoughts and opinion on a variety of product samples in the form of a questionnaire that have results from the data set. The main purpose for first questionnaire is to get the data about which design of air freshener that consumer prefer to buy. There only have 2 survey that needed to get the data set for Kansei engineering product development improvement.

3.3.1.1 Preliminary Survey

Meanwhile, the first section in the survey was asking about respondents' general information such as age and gender. Next, for the second section the question was about selection of product that related to domain product which is available in market. There have about 37 type of air freshener design that have been selected. In this section also asking about the shape that more users prefer as well as the color more preferred. The color that has been listed is related to the interior design color that suitable for home decoration. There has some feature that may affect the emotion of users such as the pattern on the casing for spray can, the size for spray hole and the way users prefer to place. Figure below represent example for questionnaire.

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3.3.1.2 Data Distribution

The survey was construct using Google Form. By using social media application like Facebook, and WhatsApp as a medium to blast both questionnaires to get attention from uses as respondent. For this study there have no target respondent. This method is applied for all survey in this research paper.

3.3.1.3 Main Survey

The result from the first survey, is a guideline that help to construct second survey question. As for second survey, product that only got highest score for product from first survey is chosen for a further question. In this survey, the question is more focused about the chosen product and more detail feature such as the appearance and feature. Moreover, using the Kansei word let the respondents choose points on each Kansei word of the number of the existing scale with expectation of respondent to the product. Same as in survey number one, firstly construct the question that related to feature that included Kansei word which is the adjective and judgement of the product.

3.3.2 Kano Model

The Kano Model is a technique for analyzing and measuring consumer demands. It's **UNIVERSITITEKNIKAL MALAYSIA MELAKA** a method of identifying clients' basic demands, as well as performance and excitement requirements. Therefore, if you include a virtual assistant option, you will increase client happiness and set yourself apart from competition.

In Kano Model product analysis have been classified in to five categories of quality elements by depending on customers satisfaction and customers requirement.

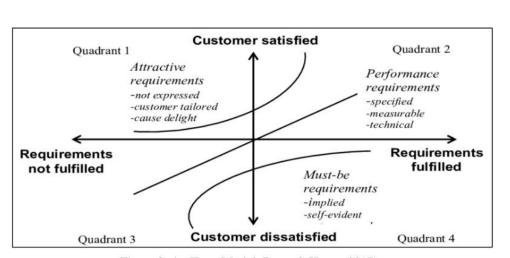


Figure 3.4 Kano Model (Rotar & Kozar, 2017).

1) Attractive quality elements

They bring satisfaction, but when they are not provided, they do not produce frustration because customers do not expect them. An increase in satisfaction leads to an increase in satisfaction, which is not the same as an increase in fulfillment.

If quality elements are met, they result in happiness; when they are not met, they lead to dissatisfaction. A rising in fulfilment leads to a potential increase in satisfaction,

whereas a loss in fulfilment leads to an equal reduction in satisfaction. ELAKA 3) Must-be quality elements

Whenever quality elements are not met, the user is dissatisfied since they are accepted as fact. However, when they are met, they don't really lead to satisfaction. A decline in fulfilment leads to an increase in discontent that is unequal to the decrease in fulfilment. 4) Indifferent quality elements

Qualities aspects that result in neither satisfaction nor discontent, whether satisfied or unsatisfied

5) Reverse quality elements

Quality characteristics that cause frustration when met and satisfaction when it's not met

Other than that, The SI (positive CS-coefficient) varies from 0 to 1. The closer the value is to one, the higher the impact of achieving the criteria on customer satisfaction; meanwhile, the closer the value is to zero, the less influence. Furthermore, the negative CS-coefficient (DI) varies from 0 to -1. This approach is used to determine the influence of the kano element on functioning, whether it is greater or lower.

3.3.3 Data Analysis (SPSS)

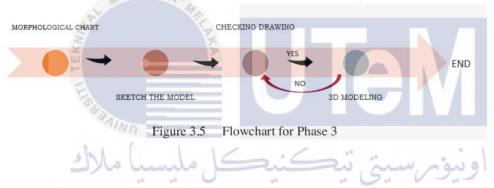
A statistical package for social science is a tool made for quantitative researches have several type of data that can be analyzed by using SPSS software such as nominal data, ordinal data, interval data and ratio data (Garth, 2008). SPSS provides many statistical analysis data such as regression, ANNOVA, quality tools and time series. It can be used to explain the data and make inferences by presenting data using graph. With this way it easy to visualize the data and validate. In main survey, it required to come out with relationships between two variables.

i. Pearson's Correlation

It is very popular statistical analysis compared to other, often used and very useful. Correlation analysis is a standard approach for determining the importance of a bivariate relationship between two variables in this study. Pearson's Correlation 49 analysis is typically performed when the requirements of this test are met (Ong & Puteh, 2017). That quantifies the link between two variables is correlation coefficient, r. As r approaches +1 (Hanushek & Jackson, 2013), an experiment with a high value for one variable is likely to have higher value for the other.

3.4 Phase 3: Product Design Development

In this research report, phase 3 is the final phase. The design and development process will be the main focus of this step, with the target customer defined, applicable product in the market defined, and selection concept for product design according to specifications required. This is the most crucial stage since it determines the project's overall outcome.



The flowchart for phase 3 is seen below shows at Figure 3.9.

3.4.1 Pugh MethodERSITI TEKNIKAL MALAYSIA MELAKA

Stuart Pugh devised the decision-matrix approach, often known as the Pugh method or Pugh idea selection. It is a qualitative methodology used to rank the multidimensional alternatives in an option set. The Pugh matrix is a mechanism for choosing the most practical approach from all provided possibilities. This is a critical tool used in the product development process to ensure that the proper concept is adopted throughout the concept selection process. There have two step to follow which are select the datum and ranking and assessment (Joshi et al., 2019).

Concept Criteria	Relience- Jio	Idea	Vodafone	BSNL	AIRTL
Network	+	+	-	+	-
Datapack	++	+	+	-	-
Talk Time	++	++	++	+	+
Validity	+++	++	+		+
Costing	++	++	+	-	-
	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	Σ^+ signs+ Σ^- signs	∑+ signs+∑- signs
	10	8	4	-1	-1

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Figure 3. 6 Illustration of Pugh method.

2.3.2 Concept Development: Morphological Chart

The first step in this process is to create a concept using morphological chart analysis. A morphological chart is a table that list all the related product features and discusses various ways as well as variation for achieving them. Through constructing single function from different function, solutions could be displayed in a chart and used as a tool for analyzing alternative solution. That stimulates the development of various combinations of solutions and ideas by using specific mechanisms by each purpose of each principle. The functions can be seen on the left side column of the table in a morphological chart, while different ideas that can be used to carry out the functions mentioned are displayed on the right.

After constructing morphological chart, the combination of idea will be created variation of new concept design to narrow down the scope. A design concept is a product improvement or innovation that improves or innovates the product's appearance, usage, and mechanical physical operation. The development of concept then sketching several drawings to visualize the product.

2.3.3 Sketching Drawing

Sketching drawing is the first step before draw the actual drawing in 3D model. By combining the concept from morphological chart, should have picture for every of it. List all the new development concept drawing. The drawing is only using normal paper. From the morphological chart, 3 concepts of design that can be present in next step.

2.3.4 3D Modelling Drawing

A 3D model is created a design, from the sketch that have been chosen from morphological chart regarding product design product. The selected sketching drawing will proceed with the detail measurement in 3D CAD modelling, and documented detail layout or drawing in Solidworks software.

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CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter covers several subjects. In this chapter, the project's outcomes will be displayed and presented. The outcomes of user preferences regarding product feature and physiognomic parameters have been gathered to identify which product received the most votes from the respondents. There have two data need to be analyzed which is related to new Kansei Engineering product development as well as Kano model method. The purpose of the survey is to gather information about consumer needs based on the functional and dysfunctional aspects of air freshener's casing. The questionnaires were then distributed to the target respondents. All the surveys are using application google form and distributed through social media. The semantic differential (SD) method is used in design development to analyses consumer requirements. To evaluate the psychological worth of product, SD is the most commonly used measuring tool in customer design methods. SD

has been used in Kansei Engineering to identify the relationship between emotional

responses and products in the design of air freshener casing. The data analysis information needed was analyzed and manipulated using several tools like Statistical Package of Sciences software (SPSS v.25) and Excel to describe the statistical information required correlation between the respondent's emotional word represented by Kansei word versus air freshener function and dysfunction expressed through customer satisfaction of the Kano

method.

4.2 Sample Size

The purpose selection survey is to get the number of responses from the user about the 35 different designs of air freshener that are available in the market. The survey contents have three sections which are first is the general information section, second is about the product background, and lastly is about product selection. There are 62 respondents who answered the survey that has been spread at random through social media. They answered the survey by selecting which product's shape, color, and pattern make them feel more attractive to

choose.

4.3 Developing Questionnaire

The questionnaire was designed in two surveys which are first to minimize the design as well as the Kansei word that have been collected. The second survey's main objective is to collect data about customer satisfaction regarding the design and the function towards the product attribute which is air freshener casing. Both surveys contain three sections labeled Section A, Section B, and Section C. In the first survey, Section A is about demography question then followed by Section B which product background and lastly Section C is asked regarding the election of Kansei word as well as an election about the existing product design. Meanwhile, for the second survey, the respondents need to answer the survey way more detail which contains three sections as well. Section A same as the first survey which is demography, Section B is about product attributes which the question is more about design selection, then Section C is about the Kano model question which asked about functional and dysfunctional regarding the air freshener.

4.4 Preliminary Survey

The preliminary test is essential since constructing the ideal survey questionnaire is difficult. In order to decide the efficient survey questionnaire, it is required to pre-test it before conducting the main survey. The purpose of this survey is to eliminate the unrequired information to minimize the information before proceeding to the main survey. Before distributing the pre-survey, the question has been checked by the expert lecturer to ensure that there does not have no mistake regarding the formatting, language, as well as the other typological error or issues. The survey, which was distributed at random via social media, received 70 responses. Based on Kansei Engineering, the preliminary survey focuses on the consumers' backgrounds in comparison to product design aspects connected to emotional or affective design. The first survey includes the respondent's information, Kansei's words, and three different meanings that based on Oxford, Longman, and Webster Merriam. About 17 Kansei's words were used in the preliminary test. The purpose of this survey is to collect information on which Kansei words were picked by respondents based on their emotions, as well as the expression of their choice for the air freshener case design

4.4.1 Demography Evaluation

For the first section question, respondents were asked about their personal information such as gender, age, and the status of residence. The figures below depict the data obtained for the general information section.

According to Table 4.1, there were 34 men and 36 women among the responders. Figure 4.1 illustrated the pie conversation based on the gender data collected from the respondents. There are 49 percent male respondents and 51 percent female responders among the 70 participants who responded to this survey.

Table 4.1 Number of respondents by	Gander
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Gander	Frequency
Female	36
Male	34
Total	70

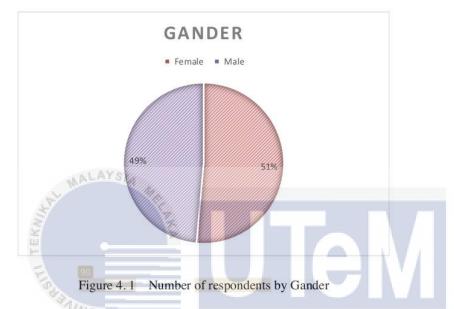
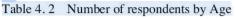


Table 4.2 illustrates the age range of those who answered to the survey. There are four age groups to choose from: 18-30, 31-40, 41-50, and 51 and above. The bar chart in figure 4.2 clearly indicates that the age range of 18 – 30 years old has the highest number of participants, with 37 respondents. Meanwhile, the age groups 31-40, 41-50, and 51 and

above had the same number of responders, which is 11.

Group of age	Frequency
18-30	37
31-40	11
41-50	11
51 AND ABOVE	11
Total	70



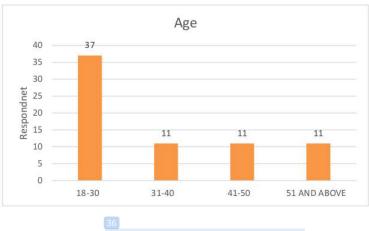


Figure 4.2 Number of respondents by Age

The next part of questionnaire is about respondents' residential status, which is divided into three categories: live alone, live with family, and live with roommate. The number of participants based on their resident status is shown in table 4.3 and graphic 4.3. According to the pie chart, the majority of respondents (59 percent or 41 people) live with their families. Meanwhile, the proportions of respondents who live alone and those who live with a roommate are not significantly different, at 14 (20%) and 15 (21%), respectively.

 Table 4, 3
 Number of respondents by Residence Status

LIN	Residence	KNIKA Frequency AYSI	
-	Live alone	14	C TTILL LLT CI CT C
	Live with family	41	
	Live with roommate	15	
	Total	70	

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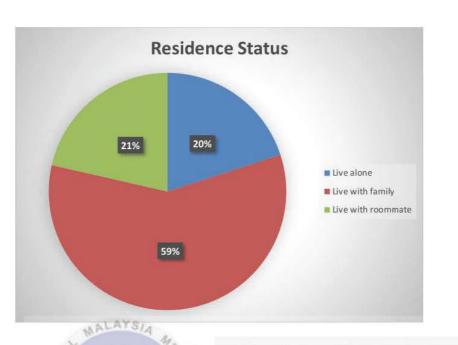


Figure 4.3 Number of respondents by Residence Status

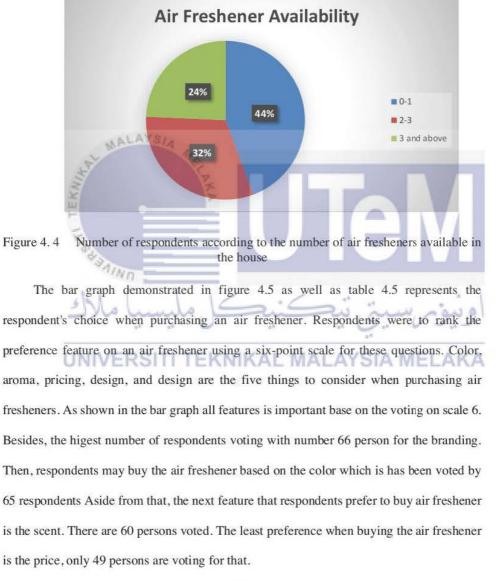
4.4.2 Product Background Evaluation

The questions in the second part are related product attributes based on the respondents' opinions. The purpose of this part is to gather opinions and preferences while determining whether or not to purchase an air freshener. The presence of air freshener in the respondent's home is shown in table 4.4 and a pie chart in figure 4.4. There are three response groups: 0-1, 2-3, and 3 and above. About 44% or 31 out of 70 respondents does not have or having only 1 air freshener in their residence. Nevertheless, about 22 (32%) participants having two to three air fresheners in their home.

Finally, there are also respondents who are having 3 and above air fresheners in their home.

Amount of air freshener	Frequency	
0-1	31	
2-3	22	
3 and above	17	
Total	70	

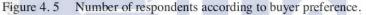
 Table 4.4
 Number of respondents according to the number of air fresheners available in the house.



Preference	Scale 1	Scale 2	Scale 3	Scale 4	Scale 5	Scale 6
Colour	0	0	2	2	1	65
Scent	2	0	1	2	7	60
Price	0	0	7	7	5	49
Design	0	0	2	4	7	57
Brand	0	0	1	1	2	66

Table 4.5 Number of respondents according to buyer preference.

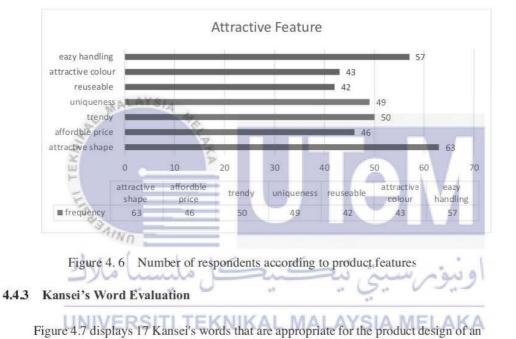




Furthermore, one of the reasons a person buys an air freshener is because it is in great shape. As a result, table 4.6 and graph 4.6 demonstrate the features that may convince a consumer to purchase the air freshener. Respondents were asked to select five out of seven features that would persuade them to buy it. The seven options are as follows: attractive shape, affordable price, trendy, uniqueness, reusable, attractive color, and easy handling. According to the table 4.6, the attribute that most influences respondents' purchase decisions is appealing shape, with over 90 percent of all respondents voting for it. Next, is the most attractive features that attract customers is easy handling product design, there have 57 persons tat select these features. After that is the least features that respondents vote is re-useable product. These characteristics are supported by 42 of the 70 respondents. Other characteristics such as trendy, uniqueness, affordable price and attractive color were chosen by 50, 49, 46, and 43 persons of those surveyed.

Feature	Frequency	Ranking
Attractive Shape	63	1
Affordable Price	46	5
Trendy	50	3
Uniqueness	49	4
Reusable	42	7
Attractive Colour	43	6
Easy Handling	57	2

Table 4.6 Number of respondents according to product features



air freshener's casing. It also displays three definitions for each word from three dictionaries: Oxford, Longman, and Webster Merriam. In this part, respondents must choose five Kansei words that represent their feeling or judgement while choosing a product design.

	1.4	Attractive and exciting to an interesting way
1.	1A 1B	Attractive and exciting in an interesting way
Elegant		Feel rich and glamor
	10	Make you feel confident and delighted
2.	2A	Popular or fashion at a particular time
Trendy	2B	Latest trend
	2C	Not really elegance
3.	3A	Creative, imaginative, inventive or original
Eye	38	Aesthetically pleasing
catching	3C	Relating to or characteristics of arts or artist
4.	4A	Possessing qualities that give great pleasure to see, hear, think about, etc.
Beautiful	4B	Wonderful; very pleasing and satisfying
	4C	Physical appearance is considered extremely attractive
5.	5A	Magnificent and imposing in appearance, size, or style.
Grand	5B	Referring to the largest or most significant item of a type
Grand	5C	Outstanding, extremely pleasant, or interesting
6.	6A	Zero expression
6. Plain	6B	No decoration
Fiain	6C	No regular or fixed
7.	7A	Judged over a period to be the highest quality and outstanding of its kind
Old fashio	n 78	Typical, classic, antique, and vintage,
	7C	A work of art of recognized and established value
	8A	Having more than one colour
8. Dual colou	8B	Good combination of colour
Dual colou	8C	Making surrounding look colourful
	9A	Defined by or employing cutting-edge method, concept, or equipment
9.	9B	Changeable from old to new development timing
Modern	90	Denoting a current or recent style or trend in art that marked by a
and the first state of the second state of the	YRIG	significant departure from traditional styles and values
10.	10A	the condition of having or showing a variety of colours
Multicolou	10B	Creating a colourful environment
	100	Colour scheme is excellent.
11.	11A	Fashionably and elegant and sophisticated
Stylish	11B	Influenced by fashionable people
	11C	Admired by many people
12.	12A	Simple operation
Easy	12B	Having or experiencing satisfaction and security
handling	12C	Handy to used
13.	13A	Pleasing or appealing to the senses
Attractive	138	Catching the intention
¢.	130	Showing good aesthetic judgement
11.14.	14A	No special features
Ordinary	148	Typically occur and usually seeing
or aniar y	140	Familiar object
15.	15A	Unlike anything else
Unique	15B	Different appearance from other product
1000	15C	Not easy to get
16.	16A	Natural or casual
Simple	168	No attractive appearance
ompie	16C	Nothing much decoration appearance
	17A	The colour used is primary colour
Bright	17B	Colour is extremely thick or vividly brilliant
	17C	Shining or glowing brightly

Figure 4.7 17 Kansei words

Moreover, from the results that have been selected by the respondents, the top five ⁷⁹ will be used in the main survey. Table 4.7 and figure 4.8 represents the results of the Kansei word selection using a bar graph. According to the graph in figure 4.8 the highest number of respondents shows at the Kansei word beautiful with the value is 38 respondents. Second highest number of respondents with value 33 persons at the Kansei word plain. For the oldfashioned word Kansei there is not much difference in the number of respondents with the usual Kansei word which is 32 people. Kansei's words elegant and eye-catching have had the same value in due to the number of responders, which is 30.

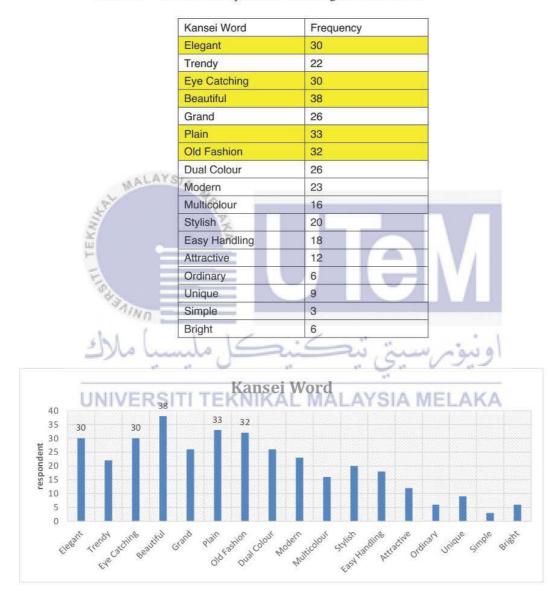
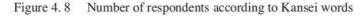


Table 4.7 Number of respondents according to Kansei words



4.4.4 Product Selection Evaluation

Shape that shows on the object is one of the factors that can influence emotion of customers in making decision. In figure 4.9 shows 35 pieces of air fresheners with five categories that represent different shape and outer features. As the purpose for this part is to reduce the number of product design based on the categories to get only one design to be used in the main survey. Table 4.8 and bar graph in figure 4.10 displays the outcome based on the responses. As a result, design A (25 persons), C (19 persons), D (26 persons), E(28 persons), F (29 persons) and G (23 persons) most of the respondents choose the first design meanwhile design B most respondents choose second design.



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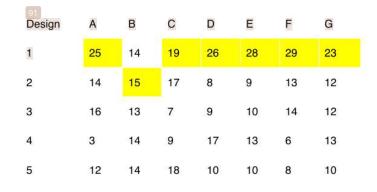


Table 4.8 Number of respondents according to design

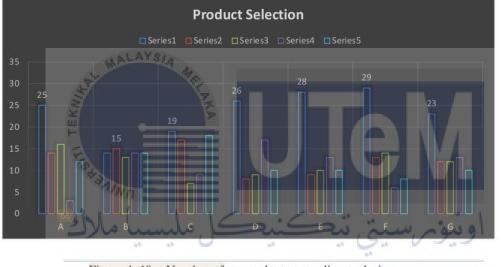


Figure 4. 10 Number of respondents according to design MELAKA

4.5 Main Survey Evaluation

The main survey is the questionnaire that is more focused on finding out the interest in customers regarding choosing the air freshener for their house. This questionnaire, it had been asking more detail about the respondent's feelings using chosen Kansei words in the pre-survey to do the design evaluation. Aside from that, it also had questions regarding functionality and dysfunctionality regarding the air freshener. Same as pre-survey, main survey also has been constructed using Google form and distributed via social media. 62

persons have been responded to this survey. As mentioned before main survey consist of three main section which is demography, product attribute and product design (Kano questionnaire).

4.5.1 Main Survey General Information Evaluation

This demography section divided into two part which is demography information and product background. Gander, age, and occupation status have been asked in demographic section while price preference, first preference toward product asked in the product background.

According to Table 4.9, there were men are majority responds to this survey. Figure 4.11 illustrated the bar chart conversation based on the gender data collected from the survey. There are 38 male respondents and 24 female responders among the 62 participants who responded to this survey

Table 4.9 Number of respondents according to gander

Gander

Female

Male

Total

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Frequency

24

38

62



Figure 4.11 Number of respondents according to gander

Table 4.10 demonstrates the age range of persons who responded to the survey. There are four age categories to pick from: 18-30, 31-40, 41-50, and 51 and above. Figure 4.12 shows pie chart clearly shows that the age range of 18 - 30 years old has the most participants, with 56% from total respondents have replies to this survey. Meanwhile, just 9 people in the age groups 31-40 participated. Respondents between the ages of 41 and 50 have the fewest number of respondents, with only seven people. Finally, 11 people between the ages of 51 and older responded to this survey.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA Table 4. 10 Number of respondents according to age

Age	Frequency
18-30	35
31-40	9
41-50	7
51 and over	11
Total	62

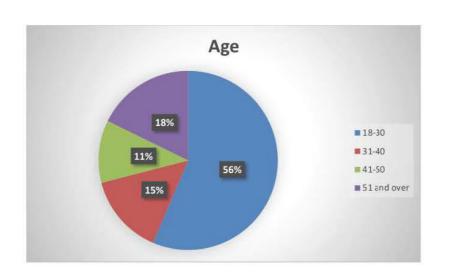


Figure 4.12 Number of respondents according to age

The final question in demographic section is about responder's occupation status which there have six groups: student, unemployed, under employed, self-employment, profession, and retired. Table 4.11 indicates the number of frequencies. The majority of the respondents to this survey are students, with a total of 33 respondents. It is clearly shown in the figure 4.13. The second highest group of occupation is retired with the value 11 persons. It can relate to the previous question regarding the age of respondent where the age of 51 and above also have the same amount of respondent. Next, the group that has the least

number of respondents the responded to this survey is self-employment, there only 4 persons.

Table 4.11	Number of	respondents acc	cording to occupation
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Occupation	Frequency
Student	33
Unemployed	6
Under Employment	6
Self-employment	4
Profession	2
Retired	11
Total	62

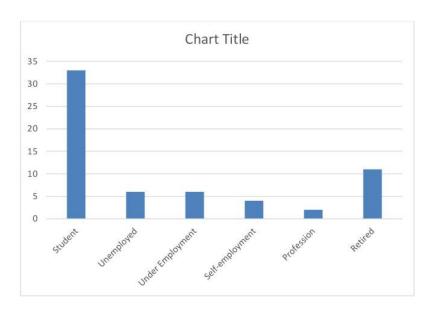
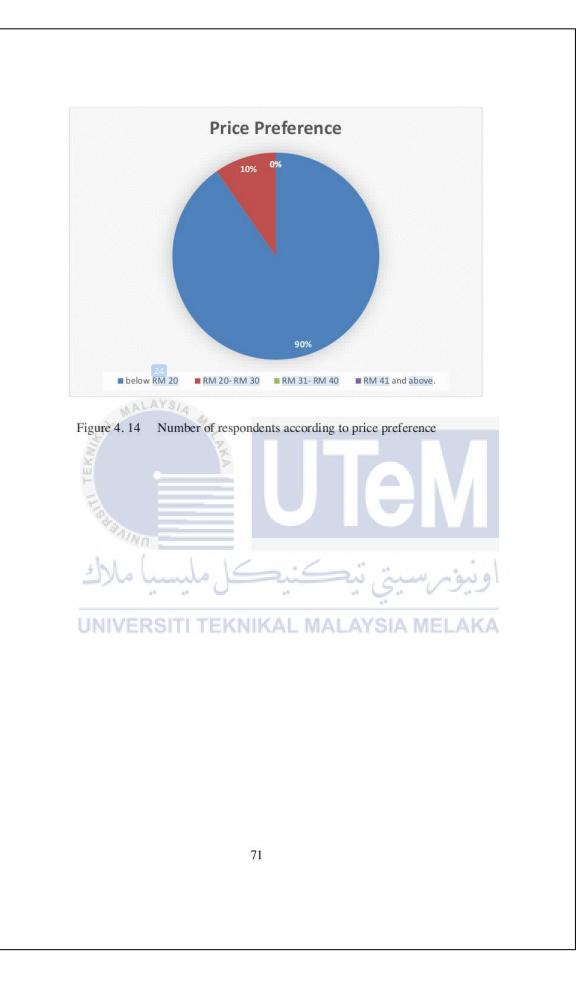


Figure 4.13 Number of respondents according to occupation

After that, for the second section is about the product background. Where the first question is about the price preferences. Four price preference have been stated in the question: below RM 20, RM 20- RM 30, RM 31- RM 40, and RM 41 and above. As shown in table 4.12 the highest frequency is 56 persons who are vote for price preference below RM 20. Only 6 persons that choose the product price range between RM 20 to RM 30 as their price preference.

Price Preference	Frequency
below RM 20	56
RM 20- RM 30	6
RM 31- RM 40	0
RM 41 and above.	0
Total	62

UNIVE	DOITI TEI	ZMUZAT	BAAL /	AVCIA	MEL	A LZ A
Table 4. 12	Number of re	spondents acco	ording to p	price prefere	ence	AUN



4.6 **Product Design Analysis**

In this study, correlation has been used as a statistical method to find out the strength of relationships in two variables, there are two sets of variables that are needed to find the relation which is the relationship between kano and Kansei next is the relationship between Kansei and Kansei. As both relationships will be used in product design development to produce new designs. Other than that, the correlation calculated by using SPSS software. By using SPSS software, the qualitative data have been converted to qualitative data. As well as the schematic data also converted to qualitative data to make it easy to be analyze.

4.6.1 Data Analysis for Relation Kansei and Kansei

The purpose of this data analysis was to define the designs but to also extract the emotions, sentiments, and ideas expressed by respondents in the primary survey in response to each design. Every design has their own attractive features that make it different from other design. In aspects of correlation, the most significant value (1 percent level of significance) and the strongest link were included in the study.

I.Design A

By referring to the table 4.13 shows the correlation between two Kansei's word in design A. Based on the data above there have five data correlation at 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design A. However, the correlation coefficient Pearson's r value shows in the table data above appeared only moderated positive and weak positive for significant correlation coefficient. There is moderate positive correlation between overall customer's view and Kansei's word 'beautiful' which is 0.405. From the r value, it shows that Design A have emotional preference which is beautiful. This feature can be derived from Design A that found on the air freshener's casing. Especially on the spray part which has a different 72

pattern compared to other air freshener's casing designs. Figure 4.15 shows the labeled

features that represent Kansei word beautiful.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.338**	0.320*	0.325**	0.264*	0.405 ^{**} Moderate positive
Plain	0.338**	1	0.178	-0.037	0.186	0.342**
_Classic	0.320*	0.178	1	0.122	0.038	0.393**
Eye-catching	0.325**	-0.037	0.122	1	0.013	0.176
Elegant	0.264*	0.186	0.038	0.013	1	0.223
Overall	0.405**	0.342**	0.393**	0.176	0.223	1

Table 4.13 Number of correlations between two Kansei word for Design A



Figure 4.15 Design A

II.Design B

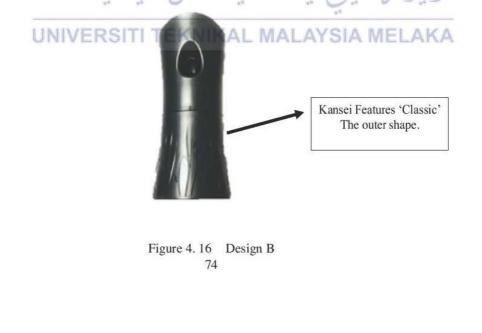
From table 4.14, by referring the significant level which mark as star, all the data shows important relationship between both Kansei's word for Design B. The highest value of

correlation coefficient in the table is 0.576 which is moderate positive correlation coefficient. It is shows that there has positive linear coefficient between the emotional preference 'classic' and the overall customer's overview about the product. From the correlation value, there have classic element in Design B features. By observing Design B features, the outer shape of air freshener's casing looks like classic and old-style shape.

Figure 4.16 shows the labeled features that represent Kansei word classic.

Table 4. 14	Number of correlations between two Kansei word for Design B
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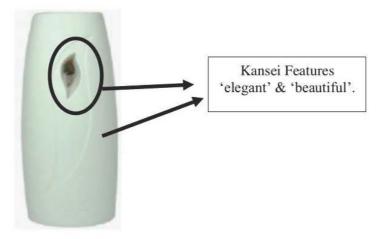
Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.384**	-0.317	0.255*	0.322*	0.388**
Plain 🔟	0.384""	1	.424**	0.334"*	0.467**	0 548**
Classic	0.317*	0.424**	1	0.280*	0.186	0.576 ^{**} Moderate positive
Eye- catching	0,255*	0.334**	0.280*	1	0.434**	0.455**
Elegant	0.322*	0.467**	0.186	0.434**	1	0.414**
Overall	0.388**	0.548**	0.576**	0.455**	0.414**	1 *

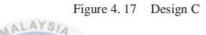


III. Design C

From table 4.15 it shows the correlation between two Kansei's word from Design C. Based on the data above the highest correlation coefficient value is 0.506 and it is 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design C. There is moderate positive correlation between 'elegant' features and 'beautiful' features. From the r value, it shows that Design C have emotional preference which is beautiful and elegant. This feature can be derived from Design C that found on the air freshener's casing. Especially on the spray hole part and the pattern that same shape as the hole which has a different pattern compared to other air freshener's designs. Figure 4.17 shows the labeled features that represent Kansei word elegant and beautiful.

Table 4.15	Number o	f correlations	between t	wo Kansei wo	ord for Desig	n C
Kansei word	Beautiful	Plain	Classic	Eye- catching	Elegant	Overall
Beautiful		0.153	0.104	0.267*	0.506 ^{**} Moderate positive	0.211
Plain	0.153	1 11/	0.011	-0.034	0.479*	0.152
Classic	0.104	0.011	Ru	0.138	-0.063	0.347**
Eye-catching	0.267*	-0.034	0.138	1 **	0.050	0.237
Elegant	0.506**	0.479**	-0.063	0.050	1	-0.090
Overall	0.211	0.152	0.347**	0.237	5-0.090	LAKA





IV.

Design D

Only three data points in table 4.16 indicate a significant correlation relationship at 1% significant level between both Kansei's words for Design D, as shown by the significant level marked with a star. The correlation coefficient with the highest value in the table is 0.511, which is a moderate positive linear correlation coefficient. It proves that there is a positive linear correlation between the emotional preference 'classic' and the overall customer's attitude towards the product. There are classic elements in Design D characteristics based on the correlation value. By observing Design D features, the color, and the pattern on the air freshener's casing it probably looks muddy. Figure 4.18 shows the labeled features that represent Kansei word classic.

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.203	0.195	0.203	-0.108	0.427**
Plain	0.203	1	0.207	-0.058	0.089	0 273**
Classic	0.195	0.207	1	0.038	0.088	0.511 ^{**} Moderate positive
Eye- catching	0.203	-0.058	0.038	1	0.224	0.243
Elegant	-0.108	0.089	0.088	0.224	1	0.190
Overall	0.427**	0.373**	0.511**	0.243	0.190	1

Table 4.16 Number of correlations between two Kansei word for Design D



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V. Design E

The correlation between two Kansei's words in Design E is seen in table 4.17. Based on the data presented above, correlation at the 1% level of significance is accessible at the weak positive linear correlation coefficient of 0.378, which is also the greatest correlation value when compared to other data. That there is a link between two separate Kansei's words for Design E is indicated. According to the table above, the high degree of correlation exists between two variables which is total respondent overview and Kansei's term 'beautiful.' The r value indicates that Design E has an emotional preference, which is lovely. This feature is taken from Design E, which is located on the air freshener's casing and has additional features that distinguish it from other designs. Especially the top half, which is shaped differently from other air freshener case designs. Figure 4.19 shows the labeled features that represent Kansei word beautiful.

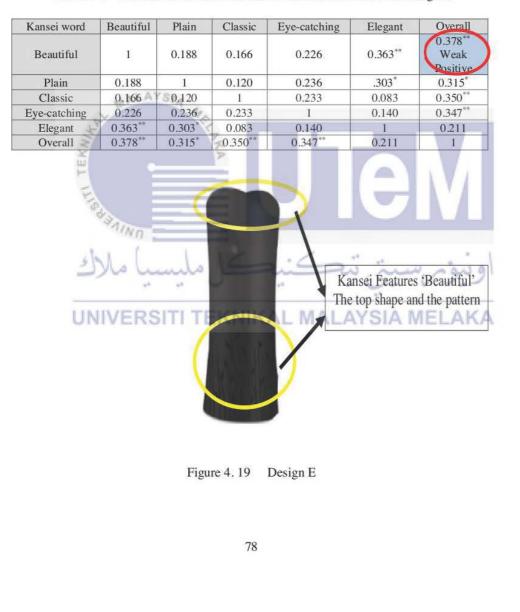


Table 4.17 Number of correlations between two Kansei word for Design E

VI. Design F

From table 4.18 it shows the correlation between two Kansei's word from Design F. Based on the data above the highest correlation coefficient value is 0.685 and it is 1% level of significant. That is indicated there are present of a relationship between 2 different Kansei's word for Design F. There is moderate positive correlation between 'elegant' features and 'beautiful' features. From the r value, it shows that Design C have emotional preference which is beautiful and elegant. This feature can be derived from Design F that found on the air freshener's casing. Especially on the spray outer shape which the curve is a different pattern compared to other air freshener's designs. Figure 4.20 shows the labeled features that represent Kansei word elegant and beautiful.

Table 4. 18 Number of correlations between two Kansei word for Design F

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.478**	0.611**	0.399**	0.685 ^{**} Moderate Positive	0.620**
Plain	0.478**	1	0.120	0.415**	0.451	0.426**
Classic	0.611**	0.120	1	0.256*	0.623**	0.539**
Eye-catching	0.399**	0.415**	0.256*	1	0.461**	0.631**
Elegant 5	0.685**	0.451**	0.623** -	0.461**	• 1	0.628**
Overall	0.620**	0.426**	0.539**	0.631**	.628**	249

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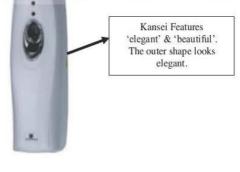


Figure 4. 20 Design F

VII. Design G

Table 4.19 shows a significant correlation link at the 1% level between Kansei's words 'Plain' and the average consumer perspective toward the product for Design G, with the greatest correlation value of 0.471. Person's product correlation has a modest positive linear correlation coefficient. Based on the correlation value, there are plain elements in Design G features. Observing Design G features, the only colour available is black, making Design G plain. The second highest correlation coefficient in the table is 0.451, which has a link between Kansei's words 'Plain' and 'Beautiful.' Because both correlations contain 'plain' Kansei's term as essential elements in Design G, it is possible to deduce that Design G is plain, yet the responder believes it is beautiful. Figure 4.21 shows the labeled features that represent Kansei word plain and beautiful

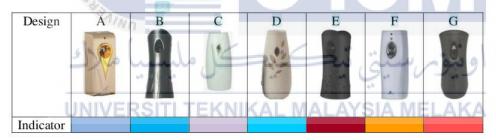
Table 4.	-	Plain		en two Kanse Eye-		
word 🗧	Beautiful		Classic	catching	Elegant	Overall
Beautiful	A AINO	0.451** Moderate Positive	0.208	0.415**	0.220	0.401**
Plain 🧯	0.451**	ula,	0.138	0.295*	0.207	0.471 [*] Moderate Positive
Classic	0.208 **	0.138	1	0.208	-0.111	0.264*
Eye- catching	0.415** NIVERS	0.295*	0.208	LMAL	0.144 AYSIA	0.129
Elegant	0.220	0.207	-0.111	0.144	1	0.238
Overal1	0.401**	0.471**	0.264*	0.129	0.238	1



Figure 4. 21 Design F

VIII. Analysis Summary

As shown in the table 4.20 is the summary for relationship between Kansei's word and Kansei's word for all design that have been selected. Throughout all, each design has its own representative, in Kansei's words, that expresses emotion from responders. According to table 8, the majority design is based on beautiful Kansei's word, while there are two designs that are based on classic.



Kansei word	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
					0.506**	0.405**
Beautiful		0.451**			0.685**	0.378**
						0.471**
Plain						
CI .				2		0.576***
Classic						0.511**
Eye catching						
Elegant						
Overall						

Table 4.20 Summary Number of Correlations Between Two Kansei Word For 7 Design

4.6.2 Data Analysis for Relationship Kansei Word and Kano Model.

The goal of this data analysis was to establish the functionality of the product design. Every design has a function that makes it useful. In terms of correlation, the study contained the most significant value, 0.001 level of significance, and 0.005 level of significance, as well as the strongest relationship.

a. Design A

Table 4.21 demonstrates the relationship between Kano's model and Kansei's word about Design A. Table 4.21 shows three significant correlations, one at the 1% significant level and two at the 5% significant level. The maximum negative correlation value presented in table 4.21 is -0.371, indicating that the strength of the correlation is moderately significant but in negative value. That also is, the relationship between Kansei's term "Classic" and Kano's word "Wall Hanging" is moving in the opposite way or has an inverse correlation. In other words, when the Kano's word 'Wall Hanging' increases, the Kansei's word 'Classic' decreases. When Design A was not hung on the wall, it seemed more classic. Other than that, timer setting versus plain design is the highest positive value correlation that shown in the table 4.21 which is 0.318. The relationship between Kansei's word 'Plain' and Kano's word 'Timer setting' is moderate positive correlation. Next, the relationship strength between Kansei's word 'Classic' and Kano's word 'To replace the fill can' is 0.253 which is weak positive correlation. Each positive value is significant correlation at 5 % significant level. Since this correlation between Kansei's word and Kano's word is significant, it indicates that the connection has a better relationship. At total for Design A, the functionality can be described from the Kano's model section which is timer setting, to replace the refill can and wall hanging function.



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Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.186	0 .318* Moderate Positive	0.163	0.204	-0.110	0.122
Charger Battery	0.022	0.046	0.101	0.036	0.003	-0.048
To Replace the Refill Can	0.219	0.208	0.253* Weak Positive	0.129	0.01	0.178
Timer Options	-0.244	0.032	0.006	-0.143	-0.121	-0.019
Wall Hanging	-0.194	AY 0.047	-0.371** Moderat e Negative	0.086	-0.049	-0.026
Self-Spray Button	0.067	-0.044	⁵ 0.238	0.083	0.102	0.045
Rectangul ar Shape	-0.031	0	0.118	-0.144	-0.095	0.069
Battery Indicator	0.150	0.185	-0.046	0.062	0.244	0.017
Spray Refill Indicator	0.248	0.062	0.064	0.068	0.155	0.175
Decoratio n Purpose	N.0.016	RS10.152	-0.005	L _{0.028} L	AY 514	M.6.003A
Vase Shape	-0.092	0.046	0.007	0.079	0.054	-0.043

Table 4. 21 Number of correlations between Kansei word and Kano model for Design A

b. Design B

By referring table 4.22 it shows the relationship of Kansei's word versus Kano's model regarding Design B. In the table there have four correlation that are significant at 0.05 level. The relationship between Kansei' word 'Plain' and Kano's word 'Vase Shape' shows the highest value in negative correlation which is -0.310. Since the correlation strength is moderate negative, which is the highest strength in the table, the variable can be extract as important feature for new design. from the inverse correlation which means Kansei's word 'Plain' increases while Kano's word 'vase shape' decreases. In other words, the casing of the basic design air freshener does not look a vase. Following that, there are two correlation values that are based on the same Kano's model word, which is charger battery. Both values are weak positive correlation value, but it is the highest strength correlation compared to other value. First is the relationship between Kansei's word 'Plain' and Kano's word 'Charger Battery' with the value 0.287. Second highest strength correlation on the table is relationship between Kansei's word 'Classic' against Kano's word 'Charger Battery' with the value is 0.268. Since both correlations are positive, an air freshener with a rechargeable battery is preferred, whether the style is basic or traditional. Finally, a significant correlation exists between Kansei's word 'Beautiful' versus Kano's word 'Rectangular Shape', although its strength is small, and it is represented by the number 0.260. It is claimed that such beautiful design is featured in rectangle form



Figure 4.23 Design B 85

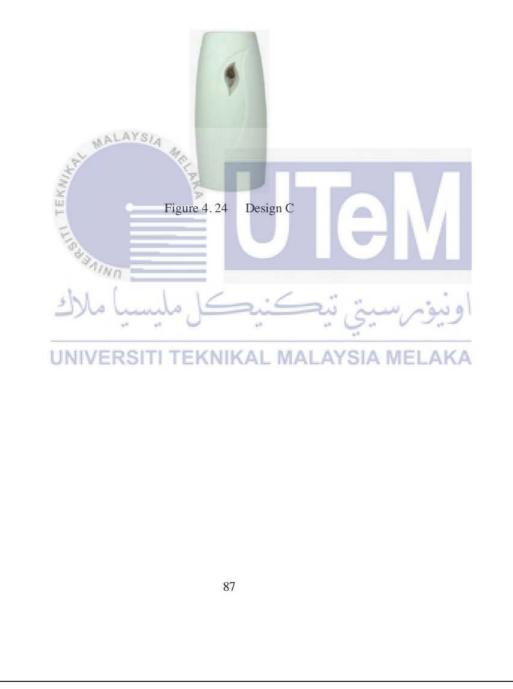
Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	-0.011	-0.052	-0.096	0.134	0.158	0.142
Charger Battery	0.205	0.287* Weak Positive	0.268* Weak Positive	0.002	0.227	0.177
To Replace the Refill Can	-0.046	-0.144	0.093	0.106	-0.095	-0.166
Timer Options	-0.077	0.227	-0.046	0.122	0.055	0.148
Wall Hanging	-0.208	0.014	-0.164	-0.09	-0.161	-0.089
Self-Spray Button	0.206	-0.021	0.076	-0.071	0.079	-0.029
Rectangul ar Shape	0.260* Weak Positive	0.020	0.133	0.009	0.139	0.058
Battery Indicator	-0.190	0.187	-0.026	0.076	0.085	-0.079
Spray Refill Indicator	0.057	0.083	0.190	0.042	0.121	0.096
Decoratio n Purpose	-0.115	0.118	-0.006	0.126	-0.096	0.003
Vase Shape	-0.025	-0.310* Moderate Negative	-0.233	-0.148 MALAY	-0.155	-0.200

Table 4. 22 Number of correlations between Kansei word and Kano model for Design B

c. Design C

Table 4.23 presents the relationship between Kansei's term and Kano's model regarding Design C for air freshener's casing. There are just two significant correlations attributed with this design where the level of significant is 5%. First, the relationship between overall review from respondent about Design C and Kano's word 'Wall Hanging' shows a negative weak correlation with the value -0.269. That's mean the relationship is

invers correlation where most of the respondent does not like the air freshener hanging on the wall. Moreover, the greatest positive correlation value in the relationship is 0.262, which is carried by Kansei's word 'Eye Catching' and Kano's word 'Self Spray Button.'. It is stated that these two variables are independent of one another because the air freshener has a self-spray button, which is one of the features that the respondent desired.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.026	-0.014	-0.172	0.012	0.056	0.147
Charger Battery	0	-0.074	-0.001	0.042	0.008	-0.007
To Replace the Refill Can	-0.043	0.233	0.040	-0.102	0.071	-0.058
Timer Options	-0.080	-0.031	-0.078	0.005	-0.236	0.005
Wall Hanging	-0.058	0.025	-0.225	0.062	0.035	-0.269* Weak Negative
Self-Spray Button	-0.092	-0.034	0.067	0.262* Weak Positive	-0.127	0.107
Rectangula r Shape	0.086	0.115	-0.076	0.078	0.170	- 0.100
Battery Indicator	0.034	0.075	0.020	0.031	-0.194	0.221
Spray Refill Indicator	-0.017	-0.179	0.133	0.058	-0.131	-0.009
Decoration Purpose	-0.054	-0.077	-0.099	0.118	-0.106	-0.157
Vase Shape	-0.057	-0.008	-0.065	0.152	S-0.134	0.186

Table 4. 23 Number of correlations between Kansei word and Kano model for Design C

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d. Design D

Table 4.24 shows that there is just one significant correlation. The correlation that has highest value in the table 4.24 is state in relationship between overall overview from respondent and Kano's word 'Wall Hanging' with the value is -0.285. The value of correlation coefficient indicates that it is an inverse correlation, implying that the relation is reversible. Since, the relationship is inversely related, with the majority of respondents disliking the air freshener hanging on the wall. Next, from the table there no positive

correlation, so the highest positive correlation in the table has chosen as a preference for the next new design features for air freshener. The correlation between Knasei's word "eye-catching" and Kano's word "rectangular shape" is fairly strong, with a value of 0.216. Respondents believe that an air freshener in a rectangular form is more visually attractive.



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.192	-0.013	-0.056	-0.001	-0.053	-0.046
Charger Battery	-0.016	0.110	0.095	0.141	0.144	0.171
To Replace the Refill Can	0.116	0.046	0.082	-0.157	0.115	0.024
Timer Options	0.118	0.096	-0.109	-0.032	-0.100	0.027
Wall Hanging	-0.232	-0.203	-0.117	-0.023	-0.029	-0.285* Weak Negative
Self-Spray Button	0.012	-0.14	0.051	0.145	0.099	0.006
Rectangular Shape	0.079	-0.13	-0.061	0.216 Weak Positive	0.152	-0.151
Battery Indicator	0.026	-0.088	-0.010	-0.088	0.086	0.103
Spray Refill Indicator	0.080	0.108	-0,079	-0.013	-0.050	0,174
Decoration Purpose	0.044	0.031	-0.106	0.024	-0.208	-0.015
Vase Shape	-0.039	-0.185	0.108	0.082	G0.026	-0.051

Table 4. 24 Number of correlations between Kansei word and Kano model for Design D

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e. Design E

Next, table 4.25 show the value of correlation coefficient between Kansei's word and Kano's word. From the table 4.25 the highest value of the correlation coefficient is 0.273 with the level of significant 5%. The relationship is between Kansei's word 'Plain' versus Kano's word 'Wall Hanging'. The correlation coefficient has a low strength. Because the highest value is significant, it may be concluded that Design E lacks an appealing characteristic that will entice responders. According to the relationships that show a substantial association, respondents felt that Design E appeared simple when it was hung on the wall.





Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.134	-0.156	-0.108	-0.028	0.132	-0.054
Charger Battery	-0.181	-0.062	-0.044	0.029	0.019	0.025
To Replace the Refill Can	-0.170	0.035	-0.007	-0.071	-0.175	-0.072
Timer Options	0.089	-0.169	-0.167	-0.032	0.162	-0.183
Wall Hanging	-0.190	0.273* Weak Positive	0.045	0.066	-0.190	0.060
Self-Spray Button	0.018	0.076	-0.025	0.105	0.036	-0.043
Rectangula r Shape	0.014	0.181	0.010	0.045	-0.130	-0.088
Battery Indicator	-0.179	-0.087	-0.077	-0.170	-0.046	-0.209
Spray Refill Indicator	0.045	-0.092	-0.062	0.039	-0.006	-0.092
Decoration Purpose	1.096	-0.068	0.073	0.058	5.0.036	0.159
Vase Shape	NI ^{0.002} RS	617-0.067EK	N10,057	M-0.196	SI29.061	A-0.128

Table 4.25 Number of correlations between Kansei word and Kano model for Design E

f. Design F

Table 4.26 indicates that there are four significant correlation coefficients with a 5% level of significance. The first correlation has the greatest correlation coefficient value of 0.299 but the strength is weak. This relationship is based on the words 'Eye Catching' by Kansei and 'Spray Refill Indicator' by Kano. This shows that responders to Design F believe that an air freshener would be more attractive if the design included a spray refill indicator.

In addition, the second highest correlation coefficient from table 4.26 shows in the relationship between Kansei's word 'Beautiful' versus Kano's word 'timer setting with the strength of correlation also weak positive. As a consequence of the results, it is apparent that Design F has a great feature on timer setting. Besides, the relationship that also have 5% significant level of correlation coefficient is between Kansei's word 'Elegant' and Kano's word 'Wall Hanging' with the value of correlation coefficient -0.260. Since the coefficient value is negative, the link between the two variables is inverse, which implies the air fresheners may seem more beautiful if they are not hung on the wall. Lastly, the relationship between Kansei's word 'Classic' and Kano's word 'Charger Battery' which have the correlation coefficient value 0.253. It's really conceivable that Design F would seem more classical if it came with a charging battery.



Figure 4. 27 Design F

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.261* Weak Positive	0.107	0.198	0.094	0.083	0.069
Charger Battery	0.141	-0.086	0.253* Weak Positive	0.062	0.119	0.201
To Replace the Refill Can	0.197	-0.067	0.042	-0.154	0.119	-0.122
Timer Options	-0.160	0.060	-0.242	-0.055	-0.201	-0.104
Wall Hanging	-0.183	-0.005	-0.151	-0.056	-0.260* Weak Negative	-0.101
Self-Spray Button	0.070	-0.056	0	0.021	0.021	0.163
Rectangular Shape	0.054	0.201	-0.042	0.009	0.018	0.034
Battery Indicator	0.019	-0.166	0.227	0.022	0.178	0.096
Spray Refill Indicator	0.127	-0.090	0.175	0.299* Weak Positive	0.160	0.225
Decoration Purpose	N-0.223-	-0.099	-0.015	-0.070	-0.165	-0.182
Vase Shape	11V-0-114SI	-0.048	-0.139	0.018	Y-0.043	-0.121

Table 4.26 Number of correlations between Kansei word and Kano model for Design F

g. Design G

Table 4.27 demonstrates the relationship between Kano's model and Kansei's word about Design G and five correlation coefficient that have same level of significant coefficient which is 5%. The highest value of correlation coefficient that have in the table 4.27 is -0.295 which is from the relationship between Kansei's word 'Eye Catching' between Kano's word 'Vase Shape'. Since the correlation value is negative, it implies that the correlation is inverse, thus the conclusion is that the design, which has a vase form, is indeed not particularly desirable. Moreover, there are two correlation values that are based on the same Kansei's word, which is classic. Both values are weak negative correlation value. The first relationship is between Kansei's word 'Classic' and Kano's word 'Self Spray Button,' that has a larger value than the other, since it has a value of -0.292. Second, is the relationship between Kansei's word 'Classic' and Kano's word 'wall hanging', with the correlation value -0.278. As a consequence of the results for both relationships, it is possible to interpret that Design G seemed less classic if the air freshener was hung from all or had a self-spray button. In the same way, there have al so two correlation that is significant in the same column on the Kansei's word which is elegant. First is the relationship between Kansei's word 'Elegant' and Kano's word 'Rectangular Shape' with the value 0.275. Since the strength of the correlation is positive weak relationship so, the correlation is directly proportional. That would be to say, Design G appeared elegant in the rectangular shape. Lastly, the relationship between Kansei's word 'Elegant' and Kano's word 'Battery Indicator' with value of correlation coefficient is -0.269. As a result, design G seemed elegant without the battery indicator



Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.139	0.046	0.030	-0.050	0.046	-0.055
Charger Battery	-0.090	0.118	-0.195	0.064	0.099	-0.248
To Replace the Refill Can	0.095	0.007	-0.040	0.117	0.031	-0.111
Timer Options	-0.087	-0.039	-0.049	-0.155	-0.141	0.035
Wall Hanging	-0.135	0.067	-0.278 [*] Weak Negative	0.111	-0.076	-0.065
Self-Spray Button	-0.002	0.002	-0.292* Weak Negative	0.064	0.219	-0.160
Rectangula r Shape	0.082	-0.020	-0.155	0.081	0.275* Weak Positive	-0.122
Battery Indicator	-0.017	-0.048	0.107	0.031	-0.269* Weak Negative	-0.103
Spray Refill Indicator	-0.137	0.035	0.032	0.172	-0.145	-0.107
Decoration Purpose	b-0.002	-0.077	-0.023	0.137	-0.159	-0.140
Vase Shape	NI ⁻⁰⁻¹³ 5RS	17 ^{-0.101} K	NI-0.112 N	-0.295* Weak Negative	A 0.098	0.158

Table 4. 27 Number of correlations between Kansei word and Kano model for Design G

h. Analysis Summary

Table 4.28 shows the summary for relationship between Kansei's word and Kano's word for all design that have been selected. The purpose for this summary is to shortlist the relationship between design and the functionality for the air freshener. According to the chart, the wall hanging Kano's word has 5 designs on it. As a result, it is possible to conclude that wall hanging is the most important functionality that can be extracted from this table

	A	В	С	D	Е	F	G
Design		C I	•	See.			Ċ
Indicator						-	

 Table 4. 28
 Summary Number of Correlations Between Kansei Word and Kano Model

 For 7 Design

Kano/ Kansei	Beautiful	Plain	Classic	Eye catching	Elegant	Overall
Timer Setting	0.261*	0.318*				
Charger Battery		0.287*	0.268*			
Charger Dattery			0.253*			
To Replace the Refill Can	LATSIA	0	0.253*			
Timer Options		P.Z.				
Wall Hanging		IN SAL	-0.371**		0.200*	-0.269*
wan Hanging		0,273	-0.278*		-0.260*	-0.285*
Self-Spray Button			-0.292*	0.262*		
Rectangular Shape	0.260*		\leq	0.216	0.275*	
Battery Indicator	1	12	. /	41	-0.269*	* 1
Spray Refill	· ·			0.299*	ومرسر	اود
Decoration Purpose	RSITI 1	EKNI	AL M	ALAYSIA	MELA	KA
Vase Shape		-0.310*		-0.295*		

4.6.3 Kano Model Evaluation.

The Kano model is used to determine customer satisfaction based on consumer requirements for a product characteristic, which is functionality. Standard Kano models are used code like M>O>A>I (Must-be, one dimensional, Attractive and indifferent) to determine Kano model attributes based on client requirements and decision making. The Kano analysis is used to classify respondents' expectations based on the combination of consumer reactions to both functional and dysfunctional questions.

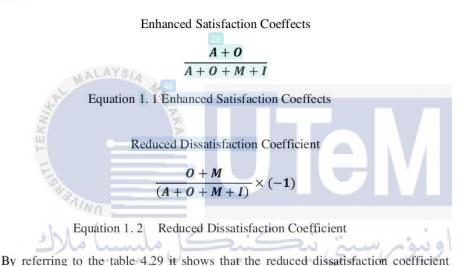
Table 4.28 displays the results for the Kano question, which was answered by 62 people. As the purpose for Kano model question is to evaluate features on function based on the probability to satisfy the user or consumers. The result from Kano question shows majority leads at the indifferent category which is nine functions lies on this category. There are two function that have highest number on Questionable category which is timer setting and battery charger with value 43 and 21 respectively. Generally, Must-be category is most important in product develop design. For charger battery functioning, there are three highest values with minor differences that range into the categories of questionable, indifferent, and must-be so, the charger battery could be changed to must-be. The minor difference value is 4. The evaluation data for indifferent category is replace the refill can (41), timer option (53), wall hanging (40) , Self-spray button (38), rectangular shape (35), battery indicator (23), spray refill indicator (34), decoration purpose (39) and vase shape (38).

Product Requirement	A	0	M	I	R	Q	Total	Category
Timer Setting	0	0	12	3	4	43	62	Q
Charger Battery	0	0	17	18	6	21	62	Q
Replace the Refill Can	0	0	5	41	12	4	62	Ι
Timer Options	0	0	4	53	3	2	62	I
Wall Hanging	0	0	8	40	13	1	62	Ι
Self-Spray Button	0	0	11	38	11	2	62	Ι
Rectangular Shape	0	0	16	35	8	3	62	Ι
Battery Indicator	0	0	23	23	12	4	62	М
Spray Refill Indicator	0	0	17	34	6	5	62	I
Decoration Purpose	0	0	12	39	10	1	62	I
Vase Shape	0	0	9	38	13	2	62	I

Table 4.28 The Result for Kano Question

4.6.4.1 CS Coefficient

The CS-coefficient of customer disappointment is followed by a minus sign to indicate that if this product quality is not reached, it will have a negative influence on customer satisfaction. The positive CS coefficient ranges from 0 to 1; the closer it is to 1, the higher the effect on customer satisfaction. A positive CS-coefficient close to 0 suggests that the impact is insignificant. At the same time, the negative CS-coefficient must be considered. [22] If it reaches zero, the influence on consumer dissatisfaction is especially strong if the examined product attribute is not satisfied. A value close to 0 implies that failing to achieve this attribute results in no discontent The respondent's satisfaction coefficient measures how many satisfactions increases when a product need is supplied and decreases when a need is not met. It is beneficial to evaluate the average impact of a product or service requirement on overall customer satisfaction. This coefficient is calculated using the following questionnaire. When the two or three most compelling requirements for each consumer group are met, the outcome is an unrivalled mix of product attributes. By adding the must-be and one-dimensional columns and dividing by the same normalization factor, the average impact on dissatisfaction can be calculated.



column has highest value which is -0.8 where the product functionality is timer setting. Other than that, the second highest value from the same column is -0.5 which the product requirements is battery indicator. Since the value is nearest to -1 it shows that the feature needs to be included in the product design or else it cm make strong impact on customers dissatisfaction.

Product	A	0	M	I	Total	Category	$\frac{A+O}{A+O+M+I}$	$\frac{O+M}{(A+O+M+I)}$
requirement							ATUTMTI	
								× (-1)
Timer	0	0	12	3	62	Q	0	-0.8
Setting								
Charger	0	0	17	18	62	Q	0	-0.48
Battery						<i>1</i>		
To Replace	0	0	5	41	62	Ι	0	-0.11
The Refill								
Can								
Timer	0	0	4	53	62	I	0	-0.07
Options		AN	LAY	SIA	the .			
Wall	0	0	8	40	62	I	0	-0.16
Hanging 🔮					E.			
Self Spray	0	0	11	38	62	Ι	0	-0.22
Button								
Rectangular	0	0	16	35	62	I	0	-0.31
Shape		UN	n -					
Battery 🔌	0	0	23	23	62	1&M		-0.5
Indicator			44	-	0	- 48	ي	a V Ja
Spray Refill	0	0	17	34	62	NIKAL	MALAYS	
Indicator		- Base I	0.00		160	and the Cert	MALATO	
Decoration	0	0	12	39	62	I	0	-0.23
Purpose								
Vase Shape	0	0	9	38	62	I	0	-0.19

Table 4. 29 The Result for CS Coefficient

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4.7 Morphological Chart.

Table shows morphological chart that have been construct from both summary table that shows relationship Kansei's word and Kano model. The aim of this chart is to capture the required product functionality and to investigate alternate strategies and combinations of delivering that functionality. There may be several different solutions for each element of product function. There have three concept that shows from the same morphological chart.

Every concept has their own sketching idea of the product.



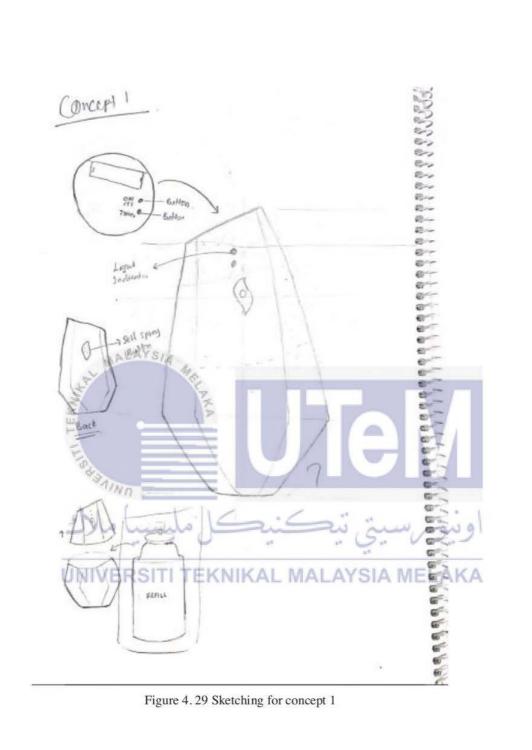


A. Concept 1



Table 4.31 The morphological chart for concept 1

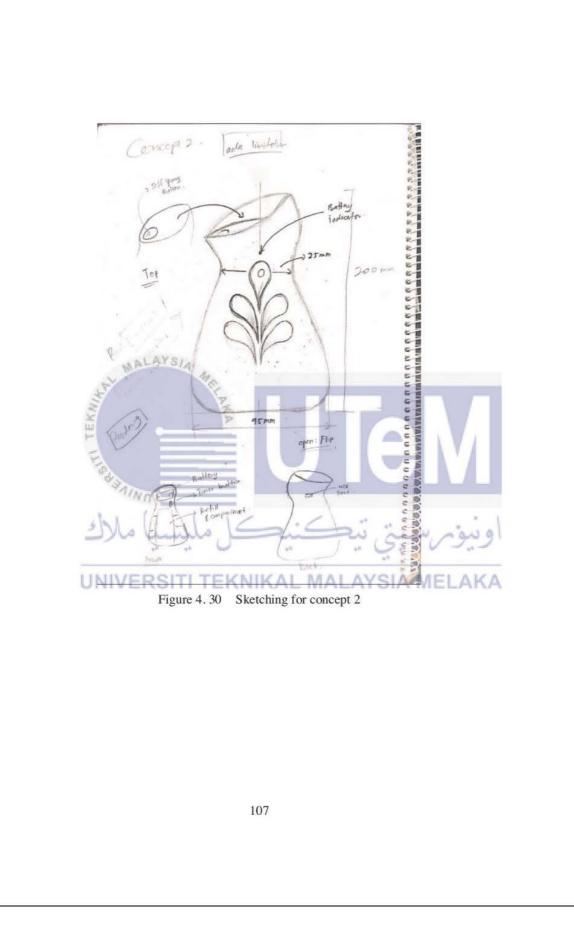
104



Concept 2 B.



Table 4.32 The morphological chart for concept 2

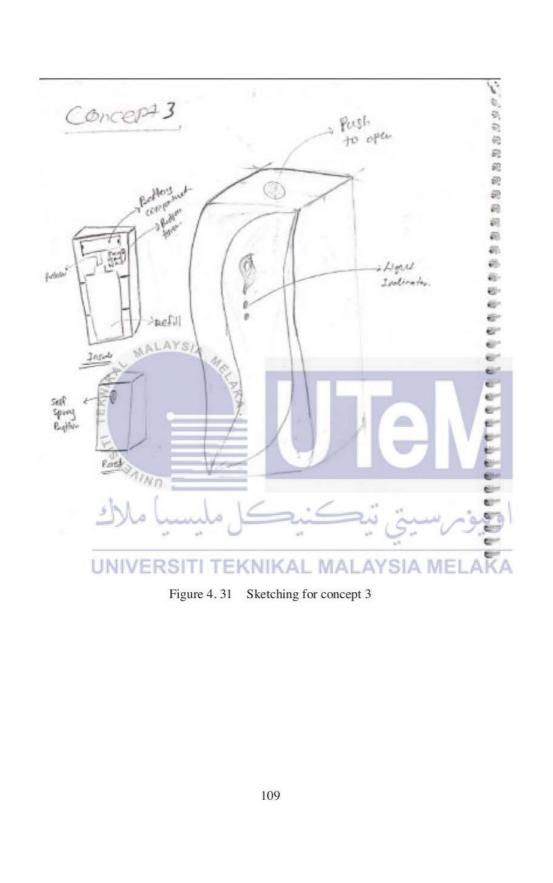


C. Concept 3



Table 4. 33The morphological chart for concept 3

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4.8 Pugh Method.

Decision matrix is a kind of prioritization matrix that allows us to choose between the list of option in product design and based on criteria regarding the functionality. The aim by doing Pugh method is to focus the result to one decision. As the morphological chart generated three different concepts, the Pugh approach was used to pick only one design concept. The table 4.34 shows the Pugh method used to choose the new design of air freshener. By rank the matrix with +1, -1 and 0. Where the -1 value represent the concept lworse than the baseline in the criteria while the +1 value shows that the concept better than the baseline criteria while the 0 value represent the concept is same as the baseline. From the table 4.34 shows the total result for the concept 2 is higher than other so concept 2 have been chosen as a new design and can proceed to 3D modeling.

KUIN	Tabl	e 4, 34 Pugh me	thod	
Criteria	Datum	Concept 1	Concept 2	Concept 3
Body shape	0	+1	+1	0
Nozzle shape	Alun 0	0	0	0
Timer Setting	0	1 -1	0,,,	0 .
Power supply	to hours	0	+1 (5	ويتومر
Refill can compartment	VER [®] ITI T	EKNIKAL	MALAYSIA	MELAK
Total		0	(+2)	0

4.9 Technical Drawing



Figure 4. 33 Technical drawing of air freshener for cover part

4.10 3D modelling Design.

3D modelling is done using SolidWork software.





MALAY Prototype air freshener behind view.



Opened Prototype air freshener.

CHAPTER 5

CONCLUSION

5.1 CONCLUSION.

In this chapter, the summary on the findings in this project will be discussed, by referring to the first objective is to study on Kansei engineering and its application towards design on a product. As for this objective have been achieved in the study of Kansei engineering in literature review. In addition, the first objective also has been achieved in the first stem in chapter four which is when the construction of preliminary survey. the findings on the material regarding Kansei word as well as the product attribute.

Second objective is to analyze data using questionnaires by applying Kansei word embedding with Kano model. As for this objective, in chapter 4 the survey regarding Kansei and Kano model have been distributed and analyzed by using SPSS software to find the correlation between 2 variables which is Kansei and Kano variable. In spite of that, there have addition method in this product development which is Kano model method. As for this method for finding the functionality in the air freshener. As for Kano model purpose to find the customers satisfaction that meet their expectation. As the result that getting in the Kano model analysis it shows that the air freshener casing is indifferent. Which means the customers dos not really care if there have different or addition feature and function at the air freshener casing.

The last objective is to develop a 3D prototype of air freshener design using Kansei engineering (emotion) embedded with Kano model (satisfaction). To achieve this goal, by using morphological chart to extract 3 concepts based on the feature that have been chosen

by respondents. From that, Pugh method has been used to select one design in order to proceed for 3D modelling. Solidwork is the software that been used to do 3D modelling.

5.2 RECOMMENDATION

Kansei engineering is one of the approaches that may be utilized to enhance existing products as well as create new products based on consumer feedback or emotions. Furthermore, the Kano model is one approach for determining if a product meets the satisfaction and expectations of its customers.

- The first recommendation offered by this researcher is that product selection should be done carefully in order to carry out this technique. It is typically used to new items that have the potential to be revolutionary.
- 2. One of the most significant components in obtaining accurate results is the selection of the appropriate responders. Furthermore, the quantity of responders should be substantial. This is due to the fact that the correlation's results are also affected by the quantity of respondents.
- The final suggestion is to change the format of the survey to allow for face-to-face interviews. It is simpler to communicate with the respondent. This can also assist Kansei engineers obtain outcomes.

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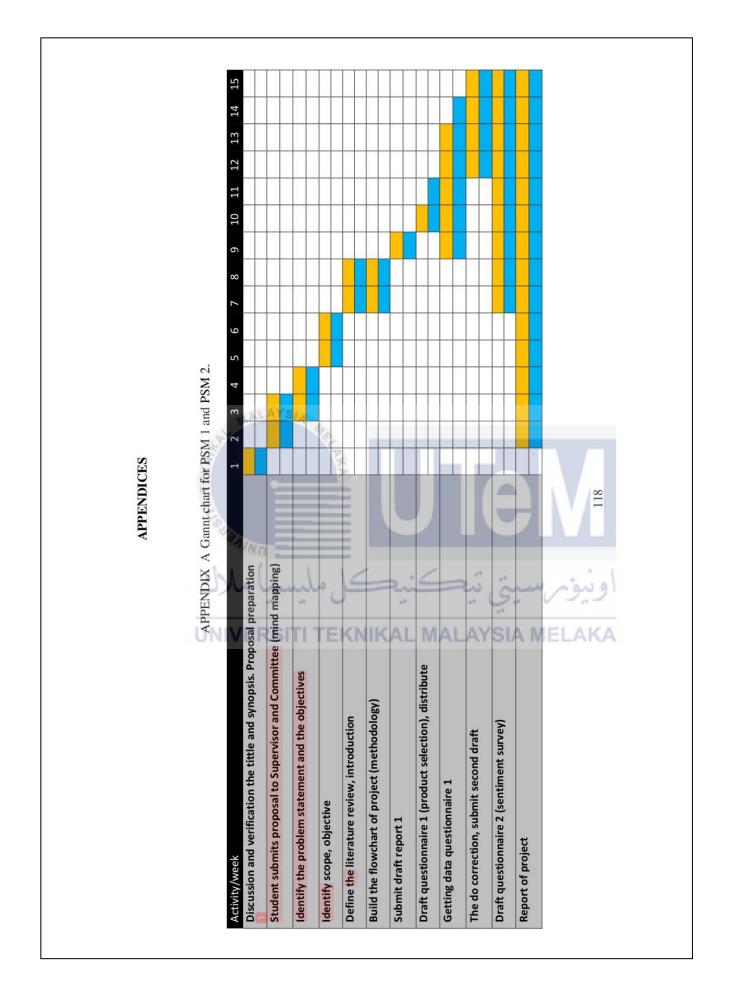
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Activity/week Draft the preliminary questionnaire regarding proc	luct selection	1	2	3	4	5	6	7	8	9	10	11	12	15	14	15
Construct preliminary survey	C In	AL TERNI														
Distribute the questionnaire	IN S	CRSHT1 LCONL	a.													
Collect data preliminary survey	m b	Ì		1								-				
Analyze data (will be used in main survey)	RS S			ANY						_						
Draft Main survey questionnaire (respondents' se		t)		SLA												
Distributed main survey	THE S		3													
Getting data main questionnaire	X C	AN AN	3.													
Analyze main survey data	NIX			-						+						
Construct the morphological chart	2.2						_									
3D modelling product design	3 N															
Report writing	A									-						
	2 .5.															
	SIA															
	\geq															
	MEL															
	5 6.															
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APPENDIX B Preliminary Questionnaire

Selection of Product Design Development On Air Freshener

Helio dear respondents, I am Nadiah Binti Zolkefle and third year student form Faculty of Mechanical and Manufacturing Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM) would like to conduct a survey related to the subject Bachelor Degree Project. The purpose for this survey is to classify customer/ consumer choice of the air freshener that available in the market. From this survey's result is used in product development to improvise or generate new product which is air freshener. I personally would like to say thank you in advanced and greatly appreciate your sincerely cooperation and support. Thank you.





 7. Five (5) words that represent your emotional feeling to the air freshener are... (Lima [5] perkataan yang mewakili perasaan emosi anda kepada penyegar udara adalah ...)







APPENDIX C Main Questionnaire





Hello dear respondents, i am Nadiah Binti Zolkefle and third year student form Faculty of Mechanical and Manufacturing Engineering Technology at Universiti Teknikal Malaysia Melaka (UTeM) would like to conduct a survey related to the subject Bachelor Degree Project that supervised by Ts. Dr. Kamaruf bin Amir Mohamed.

The purpose for this survey is to classify customer/ consumer choice of the air freshener that available in the market. From this survey's result is used in product development to improvise or generate new product which is air freshener. Emotional goods (Kansel Engineering) will be selected and studied in this questionnaire based on customer preferences for consumer items. This questionnaire is divided into three sections. In Section 1, you are questioned on general information, product history, and customer views. Section 2 includes the Big 5 inventory personality traits, which is connected to consumer characteristics, and Section 3 includes 7 furniture product designs with Kansel words to explain customer preferences on product design qualities based on Kansel Engineering.

Your participation is entirely voluntary, and all information you supply will be kept completely secret. I sincerely beg your support in participating in this study. I appreciate the time you took to help me with my research and promise to use the facts I've learned to think about and make beneficial changes. I personally would like to say thank you in advanced and greatly appreciate your sincerely cooperation and support.

*Required

SECTION 1: General information

. 1. Gander (Jantina)*

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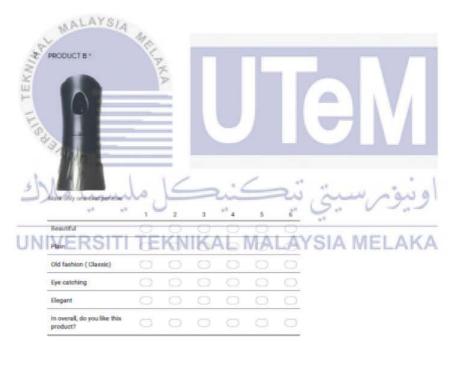


6. PRODUCT A*



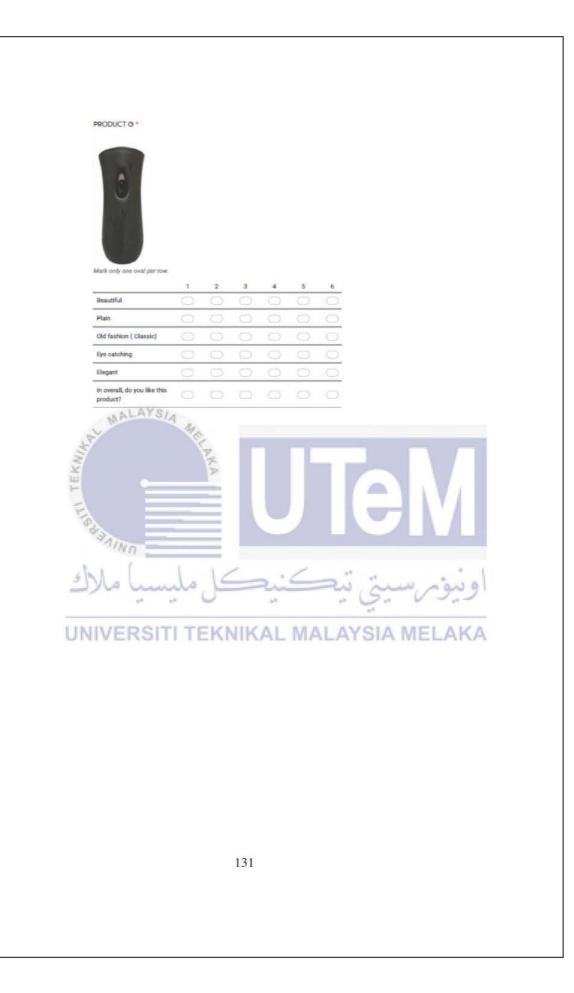
Mark only one oval per row.

	1	2	3	4	5	6
Beautiful						
Plain	0	0	0	0	0	0
Old fashion (Classic)			\bigcirc			
Eye catching			0		0	
Elegant	0	0	0	0	0	0
In overall, do you like this product?	0	0	0	0	Ð	0



Mark only one ovel per row.	1 2	3 4	5 6			
Beautiful	00	00		7		
Plain	0 0	0 0				
Old fashion (Classic)	0 0	0 0		-		
Eye catching	0 0	0 0				
Elegant	00	00	0.0			
In overfail, do you like title product?	00	00	00	-		
PRODUCT D*	ale,			-		
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Merkali Sector Davak	TEKN	IIIZAT		4.4	JELAK	Δ
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Beautiful	0 0	0 0	00			
	0 0	0 0				
Plain Old fashion / Classic		00				
Old fashion { Classic	0.0					
Old fashion { Classic Eye catching	0 0	0 0				
Old fashion (Classic Eye catching Elegant	0 0	0 0	0 0			
Old fashion (Classic Eye catching Elegant	0 0	0 0	0 0			
Old fashion { Classic Eye catching						
Old fashion (Classic Eye catching Elegant In overall, do you like this	0 0	0 0	0 0			
Old fashion (Classic Eye catching Elegant In overall, do you like this	000	0 0	0 0			

	PRODUCT E *												
	Mark only one oval per row.	1	2	3	4	5	6						
	Beautiful	Ó	Ô	Ô	0	0	0						
	Plain	0	0	0	0	0	0						
	Old fashion (Classic)	0	0	0	0	0	0						
	Eye catching	0	0	0	C	0	0						
	Elegant	0	0	0	0	0	0						
	in overall, do you like this products ATSTA	0					0						
ASITI TEKNIK	VND												
لأك	Mark coly one oval per roik.	مل	2	3		5	•• 5.	1.0	<u>م</u>	"v	_	ون	1
لأك	-()	ہ ر TEI				181	20	1.0		<i>~</i> //	_	وني ٨٨٨	A
لأك	Mark only one oval per row.			3 1120			20	1.0		"/ ME	_		A
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ر NINU	Mark coly one oval per row.			3 0000	0000		3 00 0 00 0	9.8		<i>°</i> v	_		



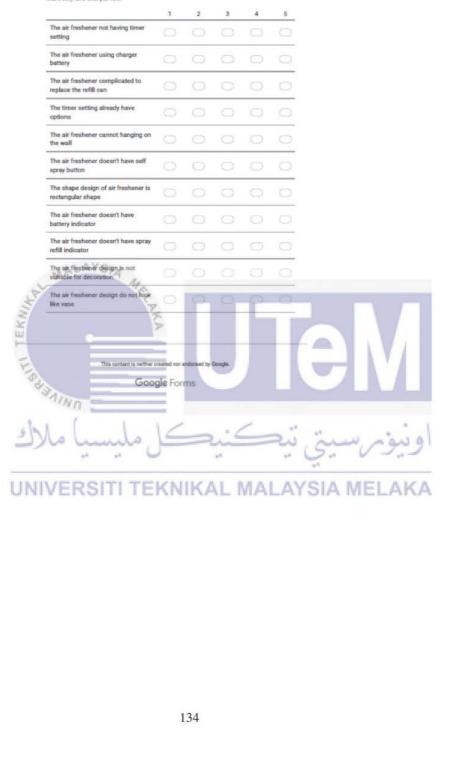


13. FUNCTIONAL: HOW DO YOU FEEL IF*

Mark only one oval per row. 1 2 2 4 5 The air freshener have timer setting The air freshener use battery The air freshener easy to replace the refill can The timer can self setting The air freshener can hanging on the wall The air freshener have self spray button The shape design of air freshener is curvy and round shape The air freshener have battery indicator The air freshener have spray refill indicator The air freshener design is suitable for decoration The air freshener design look like vaue 24 9. This section requires you to answer the simple Kano Questionnaire. Please tick the 22 rating as the selected answer. HE LARE OF CAN LIVE WITH IT MUST NE I'M NEUTRAL CHISLING **JAINO** اونيومرسيتي ملاك 2 UNIVERSITI TEKNIKAL MALAYSIA MELAKA

14. DYSFUNCTIONAL: HOW DO YOU FEELS IF*

Mark only one oval per row.



APPENDIX D SPSS data correlation

			Correla	ations					
		Kt-timer setting	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatchi ng	D1_Elegant	D1_Overall	
K1-timer setting	Pearson Correlation	1	.186	.318	.163	.204		.122	
	Sig. (2-tailed)		.148	.012	.206	.111	.396	.345	
	N	62	62	62	62	62		62	
D1_Beautiful	Pearson Correlation	.186	1	.338	.320	.325	.264	.405"	
	Sig. (2-tailed)	.148	24	.007	.011	.010	7207628	.001	
	N	62	62	62	62	62		62	
D1_Plain	Pearson Correlation	.318	.338	1	.178	037	8	.342"	
	Sig. (2-tailed)	.012	.007		166	776		007	
	N	62	62	62	62	62	(62	
D1_Classic	Pearson Correlation	.163	.320	.178	1	.122		393	
and the second second second second second second second second second second second second second second second	Sig. (2-tailed)	.206	.011	.166	3	.346		.002	
	N	62	62	62	62	62		62	
01_Eyecatching	Pearson Correlation	.204	.325	037	.122	1		.176	
Di_clecaterinid	and the second se	NGC 042		\$3.955	110.852		GE 11 548/32/1	///.508/2	
	Sig. (2-tailed)	.111 62	.010	.776	.346		.923	.171	
Dt Element	N Pearson Correlation	110	62 .264	62 .186	.038	.013		.223	
D1_Elegant	-								
	Sig. (2-tailed)	.396	.038	.149	.772	.923		.082	
	N	62	62	62	62	62		62	
D1_Overall	Pearson Correlation	.122	.405	.342	.393	.176		1	
	Sig. (2-tailed)	345 62	.001	,007	.002	.171	.082	62	
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