UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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

NADIAH BINTI ZOLKEFLEE

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

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Faculty of Mechanical and Manufacturing Engineering Technology

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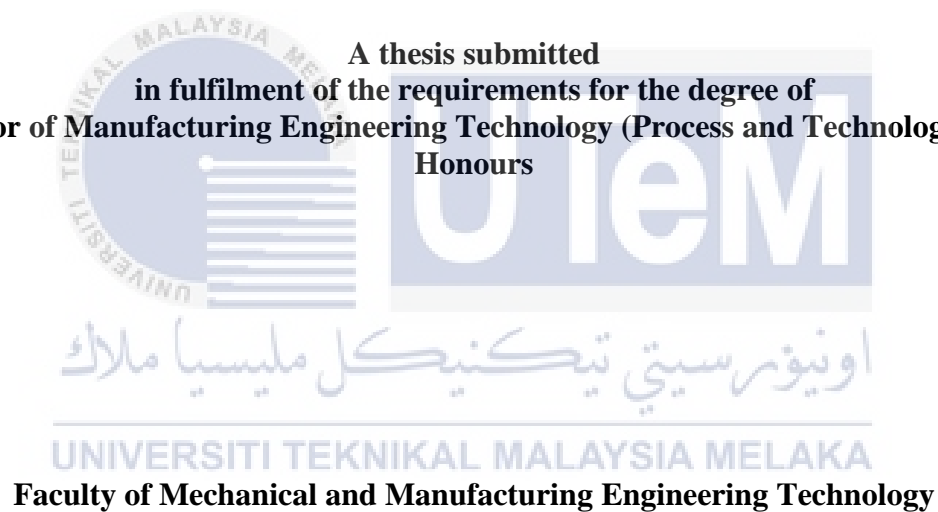
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NADIAH BINTI ZOLKEFLEE

A thesis submitted
in fulfilment of the requirements for the degree of
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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.

Signature   :

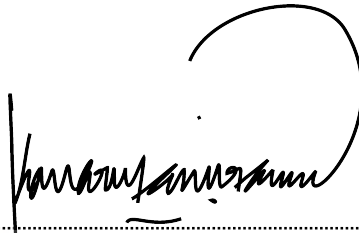Name   :   Nadiah Binti Zolkeflee

Date   :   27/ 1/2022

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

Date   : 27/1/2022

Ts. Dr. Kamarul Bin Amir Mohamed, CEng MIMechE
Senior Lecturer
Faculty of Mechanical and Manufacturing Engineering Technology
Universiti Teknikal Malaysia Melaka

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 pre-survey. 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.

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

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

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

2. 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.

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

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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.

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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.

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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

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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)

Type	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.

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III	Kansei Engineering modelling	• Mathematical modelling with an interference engine and databases
IV	Hybrid Kansei Engineering System	• The combined computer system or forward 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 Engineering Designing	• Group work design system utilizing intelligent software and databases over the internet

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

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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 traits	Ergonomic expriment	Automotive engineering
Zero	1st	2nd	nth			
HMU	Tight feeling		· · · ·	Size Width Height Seat	Tight feeling experiment Interior kansei expeiment	Chassis design Sheet design Interior design Power train
	Direct feeling		· · · ·	Steering design	Steering function	development Steering yaw ratio
	Speedy feeling		· · · ·	Shift lever Speed meter Frequency	Shift lever length Minus gravity	Steering design Shift lever design Speed meter design
	Communication		· · · ·	Open style	Noise frequency analysis	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).

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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

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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						Attractive
Ugly						Beautiful
Uncreative						Creative, innovative
Not harmonious						Harmonious
Inclusive						Exclusive
Complex						Simple
Not appealing						Appealing, dazzling
Not Aesthetics						Aesthetics
Not inspiring						Inspiring
Untidy						Tidy
Rigid						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)

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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

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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.

Table 2. 2   List of data collection methods

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

		answer in first objective paper (Djatna & Kurniati, 2015).
6	Design in innovative alarm clock made from bamboo	First find the respondent that agree with the 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 pen	The study collected 27 sample of ball pens come from different companies. The 24-respondent female student using 5-point SD scale measurement to evaluate each pen and consist of 40 Kansei words (Nishino, 2010).
9	Kansei engineering approach for consumer ' s perception of the ketchup sauce bottle	The samples were collected from all type of product from different company. 8 type of 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

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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.

Table 2. 3   Methodology used in 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 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)

		2. Cluster weighting factors (design parameter)
		3. Aim to optimize the sample of all factors
		4. Perform fuzzy evaluation.
3	Systematically emotional design method of products', it also can be used to design mini digital camera	The data is evaluated by using MDS in SPSS 18.0 it also includes RSQ (square correlation). To estimate value between the computed result and observation data, stress value need in smaller value. For better result, stress value need in lower value (Guo et al., 2014).
4	A walking stick as an older Japanese people	In the study of emotion, the evaluation more referring to the user emotion through walking stick by Kansei sheet as well as the interviews revealed the emotions (Elokla & Hirai, 2015).
5	Design for packaging design of powder shape freshener	Quantification theory type 1 (QTT1) is used by Djatna and Taufik (2015) to evaluate the result. This method is known as quantitative and categorical multiple regression analysis method.
6	Design in innovative alarm clock made from bamboo	To analyses the innovation alarm clock is used 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 design	Analysis data is done by using Viramax method. This method shows that cumulative contribution from several factor which is from Kansei word (Nagamachi et al., 1959).
8	Designing comprehensive ball pen	Multiple linear regression analysis is used to 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 approach for consumer's perception of the ketchup sauce bottle	In this research used statical tool Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's Test of sphericity. KMO statistic should be 0.6 or greater. Bartlett's Test has a p-value less than 0, 0001 showing that there are 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 5-point 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 multi-dimensional 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

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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

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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 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 eye-catching 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

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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 well-defined 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

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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

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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

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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

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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.

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

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

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

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

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.

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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

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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.

Table 3.1   Kansei word for air freshener's casing.

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

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 Model

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 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.

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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

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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.

Figure 3.5   Flowchart for Phase 3

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).

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Concept Criteria	Relience-Jio	Idea	Vodafone	BSNL	AIRTL
Network	+	+	-	+	-
Datapack	++	+	+	-	-
Talk Time	++	++	++	+	+
Validity	+++	++	+	-	+
Costing	++	++	+	-	-
	∑+ signs+∑- signs	∑+ signs+∑- signs	∑+ signs+∑- signs	∑+ signs+∑- 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

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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.

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.

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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.

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Table 4. 1   Number of respondents by gender

Gender	Frequency
Female	36
Male	34
Total	70
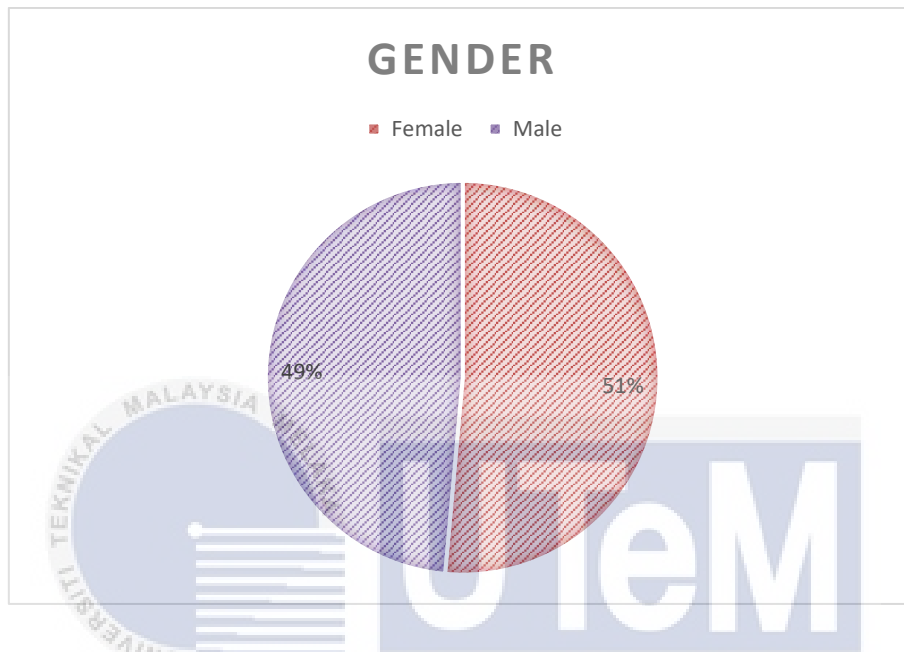
Figure 4. 1   Number of respondents by gender

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.

Table 4. 2   Number of respondents by age

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

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.

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

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

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 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.

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Table 4. 5   Number of respondents according to buyer preference.

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

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.

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Table 4. 6   Number of respondents according to product features

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

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.

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

Table 4. 7   Number of respondents according to Kansei words

Kansei Word	Frequency
Elegant	30
Trendy	22
Eye Catching	30
Beautiful	38
Grand	26
Plain	33
Old Fashion	32
Dual Colour	26
Modern	23
Multicolour	16
Stylish	20
Easy Handling	18
Attractive	12
Ordinary	6
Unique	9
Simple	3
Bright	6

Figure 4. 8   Number of respondents according to Kansei words

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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

Table 4. 8   Number of respondents according to design

Design	A	B	C	D	E	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

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

Gender	Frequency
Female	24
Male	38
Total	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.

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 according to occupation

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.

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

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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

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 pattern

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

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

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

Kansei Features 'Beautiful'

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

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

Kansei Features 'Classic'
The outer shape.

Figure 4. 16   Design B

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 of correlations between two Kansei word for Design C

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	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	1	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

Kansei Features 'elegant' & 'beautiful'.

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.

Table 4. 16   Number of correlations between two Kansei word for Design D

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	0.373**
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

Kansei Features 'Classic'
The color and pattern.

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

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

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	0.685^{**}	0.451^{**}	0.623^{**}	0.461^{**}	1	0.628^{**}
Overall	0.620^{**}	0.426^{**}	0.539^{**}	0.631^{**}	$.628^{**}$	1

Kansei Features 'elegant' & 'beautiful'. The outer shape looks elegant.

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

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.451** Moderate Positive	0.208	0.415**	0.220	0.401**
Plain	0.451**	1	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**	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

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Kansei Features
'plain' & 'beautiful'.
The leave pattern look plain
as it same color as body
paint. .

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.

Design	A	B	C	D	E	F	G
Indicator							

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

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

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

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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.

Figure 4. 22   Design A

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

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** Moderate Negative	0.086	-0.049	-0.026
Self-Spray Button	0.067	-0.044	0.238	0.083	0.102	0.045
Rectangular 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
Decoration 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

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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

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

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
Rectangular 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
Decoration 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	-0.155	-0.200

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

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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.

Figure 4. 24   Design C

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

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
Rectangular 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	-0.134	0.186

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.

Figure 4. 25   Design D

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

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

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

Table 4. 25   Number of correlations between Kansei word and Kano model for 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
Rectangular 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	-0.096	-0.068	0.073	0.058	0.036	0.159
Vase Shape	0.002	-0.067	-0.057	-0.196	-0.061	-0.128

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.

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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

Table 4. 26   Number of correlations between Kansei word and Kano model for 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	-0.015	-0.070	-0.165	-0.182
Vase Shape	-0.114	-0.048	-0.139	0.018	-0.043	-0.121

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

Figure 4. 28   Design G

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

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
Rectangular 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	-0.002	-0.077	-0.023	0.137	-0.159	-0.140
Vase Shape	-0.135	-0.101	-0.112	-0.295* Weak Negative	0.098	0.158

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	B	C	D	E	F	G
Design							
Indicator	(gray)	(blue)	(light purple)	(light blue)	(dark red)	(orange)	(red)

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*			
			0.253*			
To Replace the Refill Can			0.253*			
Timer Options						
Wall Hanging		0.273*	-0.371**		-0.260*	-0.269*
			-0.278*			-0.285*
Self-Spray Button			-0.292*	0.262*		
Rectangular Shape	0.260*			0.216	0.275*	
Battery Indicator					-0.269*	
Spray Refill Indicator				0.299*		
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).

Table 4.28 The Result for Kano Question

Product Requirement	A	O	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	I
Timer Options	0	0	4	**53**	3	2	62	I
Wall Hanging	0	0	8	**40**	13	1	62	I
Self-Spray Button	0	0	11	**38**	11	2	62	I
Rectangular Shape	0	0	16	**35**	8	3	62	I
Battery Indicator	0	0	**23**	**23**	12	4	62	M
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

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. 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

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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

$$\frac{A + O}{A + O + M + I}$$

Equation 1. 1 Enhanced Satisfaction Coeffects

Reduced Dissatisfaction Coefficient

$$\frac{O + M}{(A + O + M + I)} \times (-1)$$

Equation 1. 2   Reduced Dissatisfaction Coefficient

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.

Table 4. 29 The Result for CS Coefficient

Product requirement	A	O	M	I	Total	Category	$\dfrac{A + O}{A + O + M + I}$	$\dfrac{O + M}{(A + O + M + I)} \times (-1)$
Timer Setting	0	0	12	3	62	Q	0	-0.8
Charger Battery	0	0	17	18	62	Q	0	-0.48
To Replace The Refill Can	0	0	5	**41**	62	I	0	-0.11
Timer Options	0	0	4	**53**	62	I	0	-0.07
Wall Hanging	0	0	8	**40**	62	I	0	-0.16
Self Spray Button	0	0	11	**38**	62	I	0	-0.22
Rectangular Shape	0	0	16	**35**	62	I	0	-0.31
Battery Indicator	0	0	**23**	**23**	62	I & M	0	-0.5
Spray Refill Indicator	0	0	17	**34**	62	I	0	-0.33
Decoration Purpose	0	0	12	**39**	62	I	0	-0.23
Vase Shape	0	0	9	**38**	62	I	0	-0.19

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.

Table 4. 30   The morphological chart

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

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A. Concept 1

Table 4. 31   The morphological chart for concept 1

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

Concept 1

Figure 4. 29 Sketching for concept 1

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B.   Concept 2

Table 4. 32   The morphological chart for concept 2

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	 Adjustable button	 Button		
Power supply	 AA Battery	 Electric supply	 Rechargeable battery	
Refill can compartment	 Socket	 Flip		

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Figure 4. 30   Sketching for concept 2

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C. Concept 3

Table 4. 33   The morphological chart for concept 3

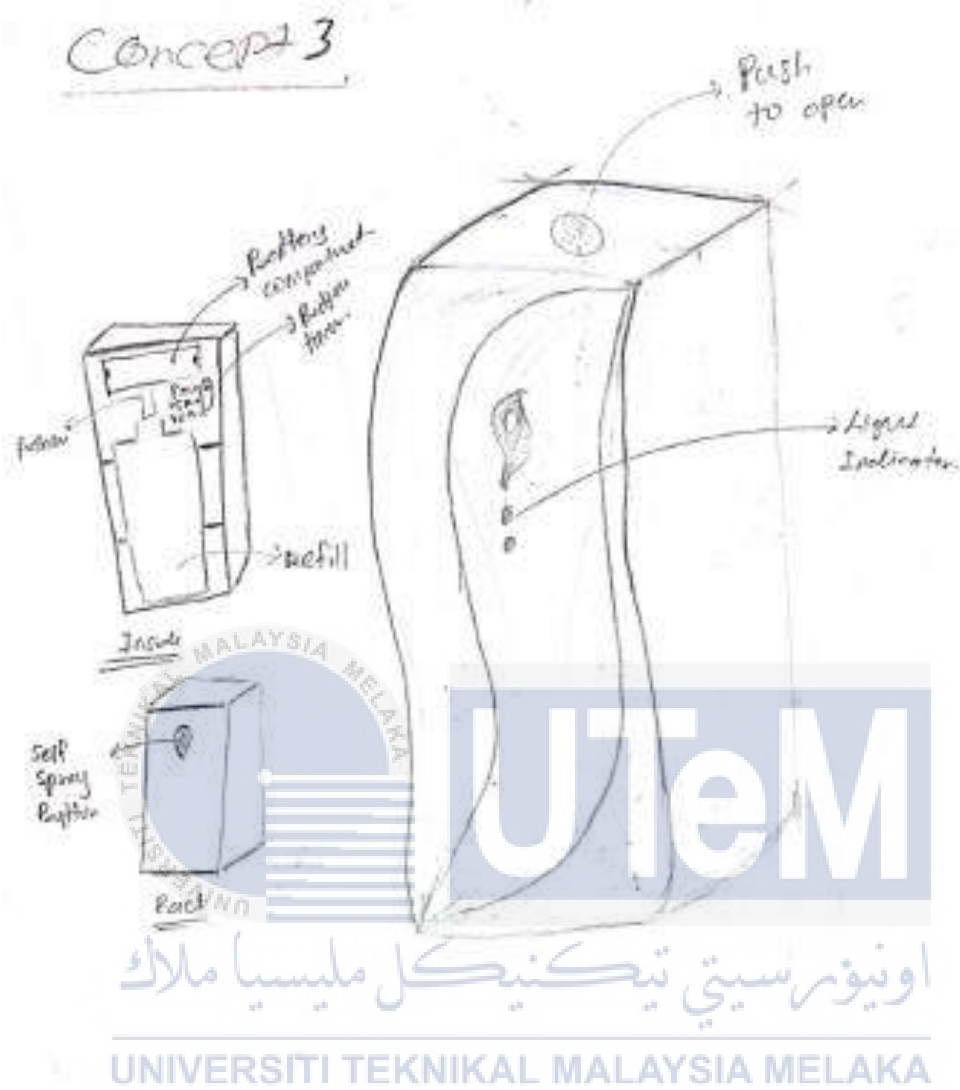| Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

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	0	0	0	0
Timer Setting	0	-1	0	0
Power supply	0	0	+1	0
Refill can compartment	0	0	0	0
Total		0	+2	0

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4.9   Technical Drawing
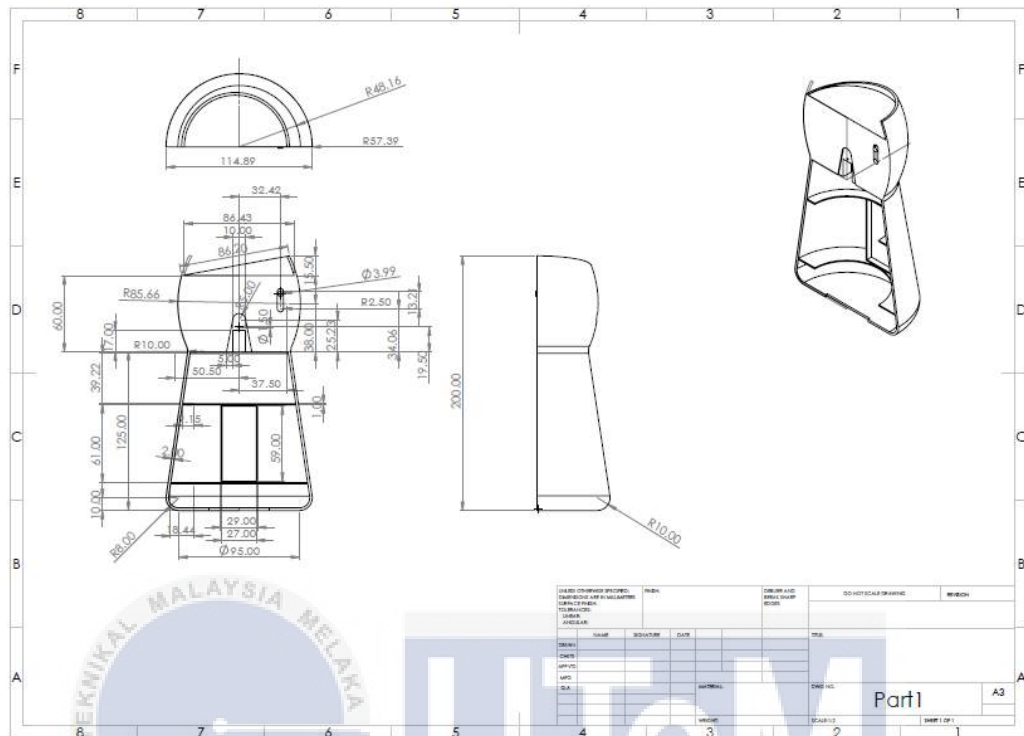

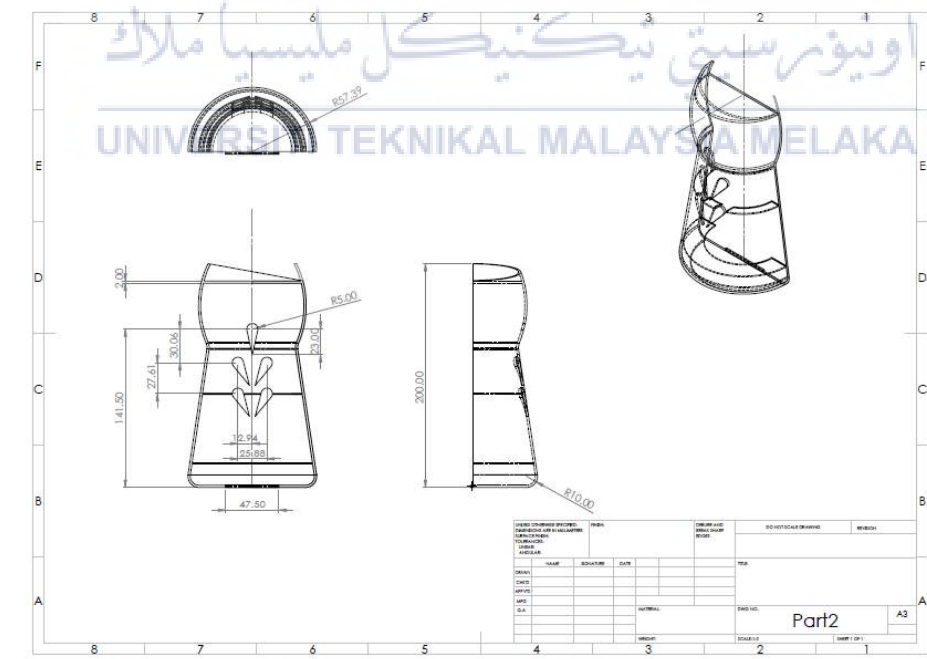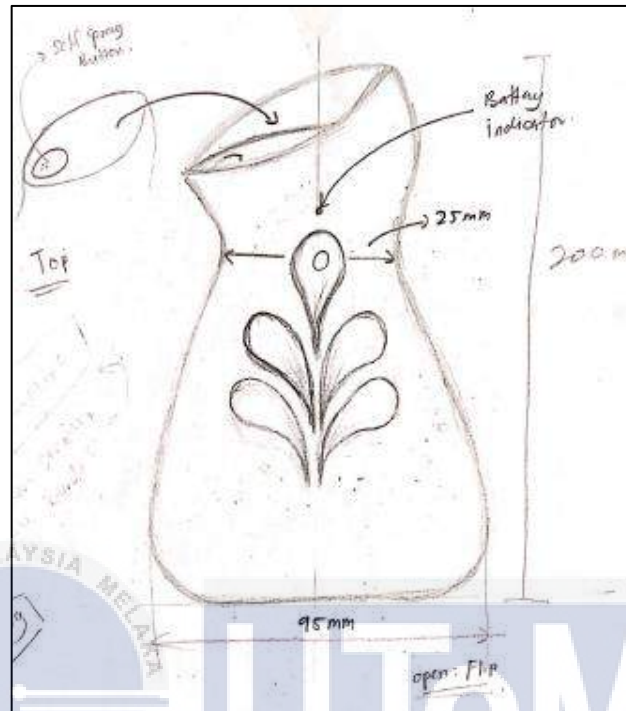Figure 4. 32   Technical drawing of air freshener for body part

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

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4.10   3D modelling Design.

3D modelling is done using SolidWork software.

Concept 2 design sketching

Prototype air freshener front.

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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.

1. 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.

3. 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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APPENDIX A Gannt chart for PSM 1 and PSM 2.

Activity/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion and verification the tittle and synopsis. Proposal preparation	■														
Student submits proposal to Supervisor and Committee (mind mapping)		■	■												
Identify the problem statement and the objectives			■	■											
Identify scope, objective					■	■									
Define the literature review, introduction							■	■							
Build the flowchart of project (methodology)							■	■							
Submit draft report 1									■						
Draft questionnaire 1 (product selection), distribute										■	■				
Getting data questionnaire 1									■	■	■	■	■		
The do correction, submit second draft												■	■	■	■
Draft questionnaire 2 (sentiment survey)							■	■	■	■	■	■	■	■	■
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		■	■												
Distribute the questionnaire			■	■											
Collect data preliminary survey					■	■									
Analyze data (will be used in main survey)							■	■							
Draft Main survey questionnaire (respondents' sentiment towaard product)							■	■							
Distributed main survey									■	■					
Getting data main questionnaire										■	■				
Analyze main survey data									■	■	■	■	■	■	
Construct the morphological chart												■	■	■	
3D modelling product design													■	■	■
Report writing		■	■	■	■	■	■	■	■	■	■	■	■	■	■

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Selection of Product Design Development On Air Freshener

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. 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

SECTION A : DEMOGRAPHY

1. 1. Gander

Mark only one oval.

◯ Female

◯ Male

2. 2. Age

Mark only one oval.

◯ 18-30

◯ 31-40

◯ 41-50

◯ 51 AND ABOVE

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

Mark only one oval.

- ◯ Live 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.
(Tinjauan ini bertujuan untuk mendapatkan pendapat dan pilihan individu ketika memutuskan untuk membeli penyegar udara.
Tandakan di kotak yang mewakili pilihan anda semasa membeli produk.)

Can tick more than 1 box.
(Boleh tanda lebih dari 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.

- ◯ 0-1
- ◯ 2-3
- ◯ 3 and above (3 dan keatas)

5. 5. You prefer to buy air freshener based on (Anda memilih penyegar udara berdasarkan aspek berikut)

LESS IMPORTANT → MOST IMPORTANT
1 2 3 4 5 6

Mark only one oval/ per row.

	1	2	3	4	5	6
Color (Warna)	◯	◯	◯	◯	◯	◯
Scent (Haruman)						
Price (Harga)	◯	◯	◯	◯	◯	◯
Design (Reka Bentuk)	◯	◯	◯	◯	◯	◯
Brand (Jenama)	◯	◯	◯	◯	◯	◯

6. 6. 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:
KANSEI
WORD

This survey is to get the opinions and feelings of each individual towards air fresheners.
Check the boxes that represent feelings and towards the product.

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

7. 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 ...)

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

Check all that apply.

☐ Elegant (Mewah)

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- ☐ 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)
- ☐ Bright (Terang)

8. PRODUCT SELECTION

In this section respondent required to mark ONE (1) design of each row of automatic air fresheners product that you prefer. (Di bahagian ini responden dikehendaki menandakan SATU (1) reka bentuk setiap baris produk penyegar udara automatik yang anda sukai.)

8. A *

| A1 | A2 | A3 | A4 | A5 |

Mark only one oval per row.

	A1	A2	A3	A4	A5
	○	○	○	○	○

9. B *

| B1 | B2 | B3 | B4 | B5 |

Mark only one oval per row.

	B1	B2	B3	B4	B5
	○	○	○	○	○

10. C *

| C1 | C2 | C3 | C4 | C5 |

Mark only one oval per row.

	C1	C2	C3	C4	C5
	○	○	○	○	○

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11. D *

| D1 | D2 | D3 | D4 | D5 |

Mark only one oval per row.

	D1	D2	D3	D4	D5
	◯	◯	◯	◯	◯

12. E *

| E1 | E2 | E3 | E4 | E5 |

Mark only one oval per row.

	E1	E2	E3	E4	E5
	◯	◯	◯	◯	◯

13. F *

| F1 | F2 | F3 | F4 | F5 |

Mark only one oval per row.

	F1	F2	F3	F4	F5
	◯	◯	◯	◯	◯

14. G *

| G1 | G2 | G3 | G4 | G5 |

Mark only one oval per row.

	G1	G2	G3	G4	G5
	◯	◯	◯	◯	◯

THANK YOU FOR YOUR TIME

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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 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 Kansei words to explain customer preferences on product design qualities based on Kansei 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.

* Required

SECTION 1 : General Information

A: Demography Information

1. Gander (Jantina) *

Mark only one oval.

◯ Female

◯ Male

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2.   2. Age (Umur) *

Mark only one oval.

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

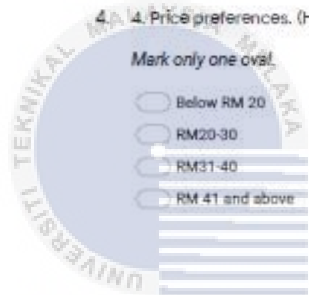3.   3. Occupation Status (Pekerjaan) *

Mark only one oval.

- [ ] Student
- [ ] Unemployed
- [ ] Under Employment
- [ ] Self-employment
- [ ] Profession
- [ ] Retired

B: Product background

4.   4. Price preferences. (Harga) *

Mark only one oval.

- [ ] Below RM 20
- [ ] RM20-30
- [ ] RM31-40
- [ ] RM 41 and above

5.   5. What are your first preferences toward Air Freshener's casing? (Apakah pilihan pertama anda terhadap sarung Penyegar Udara?) *

Mark only one oval.

- [ ] Brand
- [ ] Aesthetics design
- [ ] Color

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.)

| STRONGLY AGREE | 1 | 2 | 3 | 4 | 5 | 6 | STRONGLY DISAGREE |

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6. PRODUCT A *

Mark only one oval per row.

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

7. PRODUCT B *

Mark only one oval per row.

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

8. PRODUCT C *

Mark only one oval per row.

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

9. PRODUCT D *

Mark only one oval per row.

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

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10. PRODUCT E *

Mark only one oval per row.

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

11. PRODUCT F *

Mark only one oval per row.

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

PRODUCT G *

Mark only one oval per row.

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

SECTION 4: Product Design (Kano Questionnaire)

Step 1

Step 2

Step 4

Step 3

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
I LIKE it that way	It MUST BE that way	I'm NEUTRAL	I CAN LIVE WITH IT that way	I DISLIKE it that way

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13. FUNCTIONAL: HOW DO YOU FEEL IF ...... *

Mark only one oval per row.

	1	2	3	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 vase	◯	◯	◯	◯	◯

9. This section requires you to answer the simple Kano Questionnaire. Please tick the rating as the selected answer.

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

14. DYSFUNCTIONAL: HOW DO YOU FEELS IF ...... *

Mark only one oval per row.

	1	2	3	4	5
The air freshener not having timer setting	◯	◯	◯	◯	◯
The air freshener using charger battery	◯	◯	◯	◯	◯
The air freshener complicated to replace the refill can	◯	◯	◯	◯	◯
The timer setting already have options	◯	◯	◯	◯	◯
The air freshener cannot hanging on the wall	◯	◯	◯	◯	◯
The air freshener doesn't have self spray button	◯	◯	◯	◯	◯
The shape design of air freshener is rectangular shape	◯	◯	◯	◯	◯
The air freshener doesn't have battery indicator	◯	◯	◯	◯	◯
The air freshener doesn't have spray refill indicator	◯	◯	◯	◯	◯
The air freshener design is not suitable for decoration	◯	◯	◯	◯	◯
The air freshener design do not look like vase	◯	◯	◯	◯	◯

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APPENDIX D SPSS data correlation

Correlations

		K1-timer setting	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	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

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		K2-charger battery	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	D1_Elegant	D1_Overall
K2-charger battery	Pearson Correlation	1	.022	.046	.101	.036	.003	-.048
	Sig. (2-tailed)		.867	.720	.435	.782	.981	.714
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.022	1	.338**	.320*	.325**	.264*	.405**
	Sig. (2-tailed)	.867		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.046	.338**	1	.178	-.037	.186	.342**
	Sig. (2-tailed)	.720	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.101	.320*	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.435	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.036	.325**	-.037	.122	1	.013	.176
	Sig. (2-tailed)	.782	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	.003	.264*	.186	.038	.013	1	.223
	Sig. (2-tailed)	.981	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	-.048	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.714	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		K3-to replace therefill can	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	D1_Elegant	D1_Overall
K3-to replace therefill can	Pearson Correlation	1	.219	.208	.253*	.129	.010	.178
	Sig. (2-tailed)		.087	.105	.047	.317	.941	.166
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.219	1	.338**	.320*	.325**	.264*	.405**
	Sig. (2-tailed)	.087		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.208	.338**	1	.178	-.037	.186	.342**
	Sig. (2-tailed)	.105	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.253*	.320*	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.047	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.129	.325**	-.037	.122	1	.013	.176
	Sig. (2-tailed)	.317	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	.010	.264*	.186	.038	.013	1	.223
	Sig. (2-tailed)	.941	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	.178	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.166	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		K3-to replace therefill can	D6_Beautiful	D6_Plain	D6_Classic	D6_Eyecatching	D6_Elegant	D6_Overall
K3-to replace therefill can	Pearson Correlation	1	.197	-.067	.042	-.154	.119	-.122
	Sig. (2-tailed)		.124	.603	.748	.233	.357	.344
	N	62	62	62	62	62	62	62
D6_Beautiful	Pearson Correlation	.197	1	.478**	.611**	.399**	.695**	.620**
	Sig. (2-tailed)	.124		.000	.000	.001	.000	.000
	N	62	62	62	62	62	62	62
D6_Plain	Pearson Correlation	-.067	.478**	1	.120	.415**	.451**	.426**
	Sig. (2-tailed)	.603	.000		.353	.001	.000	.001
	N	62	62	62	62	62	62	62
D6_Classic	Pearson Correlation	.042	.611**	.120	1	.256*	.623**	.539**
	Sig. (2-tailed)	.748	.000	.353		.044	.000	.000
	N	62	62	62	62	62	62	62
D6_Eyecatching	Pearson Correlation	-.154	.399**	.415**	.256*	1	.461**	.631**
	Sig. (2-tailed)	.233	.001	.001	.044		.000	.000
	N	62	62	62	62	62	62	62
D6_Elegant	Pearson Correlation	.119	.695**	.451**	.623**	.461**	1	.628**
	Sig. (2-tailed)	.357	.000	.000	.000	.000		.000
	N	62	62	62	62	62	62	62
D6_Overall	Pearson Correlation	-.122	.620**	.426**	.539**	.631**	.628**	1
	Sig. (2-tailed)	.344	.000	.001	.000	.000	.000	
	N	62	62	62	62	62	62	62

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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SESI PENGAJIAN: **2021/22 Semester 1**

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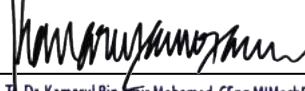
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_____
TL Dr. Kamarul Bin Amir Mohamed, CEng MIMechE
Senior Lecturer
Faculty of Mechanical and Manufacturing Engineering Technology
Universiti Teknikal Malaysia Melaka

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285 A JALAN 2 TAMAN LEMBAH

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+606 270 1000
+606 270 1022
www.utem.edu.my

FAKULTI TEKNOLOGI KEJURUTERAAN MEKANIKAL DAN PEMBUATAN
Tel : +606 270 1184 | Faks : +606 270 1064

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Nama pelajar: NADIAH BINTI ZOLKEFLEE (B091810051)
Tajuk Tesis: DESIGN AND DEVELOPMENT OF AIR FRESHENER'S CASING BY USING KANSEI ENGINEERING AND KANO MODEL.

3.   Hal ini adalah kerana IANYA MERUPAKAN PROJEK YANG DITAJA OLEH SYARIKAT LUAR DAN HASIL KAJIANNYA ADALAH SULIT.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"
"KOMPETENSI TERAS KEGEMILANGAN"

Saya yang menjalankan amanah,

TS.DR KAMARUL BIN AMIR MOHAMED
Penyelia Utama/ Pensyarah Kanan
Fakulti Teknologi Kejuruteraan Mekanikal dan Pembuatan
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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

NADIAH BINTI ZOLKEFLEE
B091810051

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

2021/2022

Faculty of Mechanical and Manufacturing Engineering Technology

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

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

**A thesis submitted
in fulfilment of the requirements for the degree of
Bachelor of Manufacturing Engineering Technology (Process and Technology) With
Honours**

Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021/2022

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.

Signature   :

Name   :   Nadiah Binti Zolkeflee

Date   :

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 Bimti Amir Mohamed
....

Date : ....

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 pre-survey. 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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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

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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).

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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

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

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

2. 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) .

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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.

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.

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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.

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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

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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

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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

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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)

Type	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.

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III	Kansei Engineering modelling	• Mathematical modelling with an interference engine and databases
IV	Hybrid Kansei Engineering System	• The combined computer system or forward 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 Engineering Designing	• Group work design system utilizing intelligent software and databases over the internet

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).

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).

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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

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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						Attractive
Ugly						Beautiful
Uncreative						Creative, innovative
Not harmonious						Harmonious
Inclusive						Exclusive
Complex						Simple
Not appealing						Appealing, dazzling
Not Aesthetics						Aesthetics
Not inspiring						Inspiring
Untidy						Tidy
Rigid						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)

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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

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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

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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.

Table 2. 2   List of data collection methods

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

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		in first objective paper (Djatna & Kurniati, 2015).
6	Design in innovative alarm clock made from bamboo	First find the respondent that agree with the 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 pen	The study collected 27 sample of ball pens come from different companies. The 24-respondent female student using 5-point SD scale measurement to evaluate each pen and consist of 40 Kansei words (Nishino, 2010).
9	Kansei engineering approach for consumer ' s perception of the ketchup sauce bottle	The samples were collected from all type of product from different company. 8 type of 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.

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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.

Table 2. 3   Methodology used in 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 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) 2. Cluster weighting factors (design parameter) 3. Aim to optimize the sample of all factors 4. Perform fuzzy evaluation.

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

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8	Designing comprehensive ball pen	Multiple linear regression analysis is used to 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 approach for consumer ' s perception of the ketchup sauce bottle	In this research used statical tool Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's Test of sphericity. KMO statistic should be 0.6 or greater. Bartlett's Test has a p-value less than 0, 0001 showing that there are 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 5-point 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).

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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 multi-dimensional 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).

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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

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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 eye-catching 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 well-defined 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

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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

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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

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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.

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

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

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

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.

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PHASE 1

RESEARCH & STUDY ABOUT KANSEI ENGGINERING

PRODUCT SELECTION
(Identify The Product To Investigated)

GETTING PRODUCT SAMPLE
(Determine The Feature Of Product)

PHASE 2

SENTIMENT ANALYSIS EVALUATION
(SPSS)

MAIN SURVEY

SAMPLE ANALYSIS
(Getting Product Information)

PRELIMINARY SURVEY
(Product Selection)

PHASE 3

MORPHOLOGICAL CHART
(Base On Data Evaluation)

SKETCHING NEW MODEL

GENERATING DESIGN
(3D Modelling)

END

Figure 3.1   Full research framework.

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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

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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.

Table 3.1   Kansei word for air freshener's casing.

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

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 Model

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 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.

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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

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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.

Figure 3.5   Flowchart for Phase 3

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).

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Concept \ Criteria	Relience-Jio	Idea	Vodafone	BSNL	AIRTL
Network	+	+	-	+	-
Datapack	++	+	+	-	-
Talk Time	++	++	++	+	+
Validity	+++	++	+	-	+
Costing	++	++	+	-	-
	∑+ signs+∑- signs	∑+ signs+∑- signs	∑+ signs+∑- signs	∑+ signs+∑- 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

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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.

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.

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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.

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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.

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Table 4. 1   Number of respondents by Gander

Gander	Frequency
Female	36
Male	34
Total	70

Figure 4. 1   Number of respondents by Gander

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.

Table 4. 2   Number of respondents by Age

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

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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

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.

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

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

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 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.

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Table 4. 5   Number of respondents according to buyer preference.

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

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.

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Table 4. 6   Number of respondents according to product features

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

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.

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

Table 4. 7   Number of respondents according to Kansei words

Kansei Word	Frequency
Elegant	30
Trendy	22
Eye Catching	30
Beautiful	38
Grand	26
Plain	33
Old Fashion	32
Dual Colour	26
Modern	23
Multicolour	16
Stylish	20
Easy Handling	18
Attractive	12
Ordinary	6
Unique	9
Simple	3
Bright	6

Figure 4. 8   Number of respondents according to Kansei words

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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

Table 4. 8   Number of respondents according to design

Design	A	B	C	D	E	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

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

Gander	Frequency
Female	24
Male	38
Total	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.

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 according to occupation

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

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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

Price Preference

0%

10%

90%

■ below RM 20   ■ RM 20- RM 30   ■ RM 31- RM 40   ■ RM 41 and above.

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

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

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

features that represent Kansei word beautiful.

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

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

Kansei Features 'Beautiful'

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

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

Kansei Features 'Classic'
The outer shape.

Figure 4. 16   Design B

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 of correlations between two Kansei word for Design C

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	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	1	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

Kansei Features 'elegant' & 'beautiful'.

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.

Table 4. 16   Number of correlations between two Kansei word for Design D

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	0.373[**]
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

Kansei Features 'Classic'
The color and pattern.

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

Kansei Features 'Beautiful'
The top shape and the pattern

Figure 4. 19   Design E

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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	0.685^{**}	0.451^{**}	0.623^{**}	0.461^{**}	1	0.628^{**}
Overall	0.620^{**}	0.426^{**}	0.539^{**}	0.631^{**}	$.628^{**}$	1

Kansei Features 'elegant' & 'beautiful'. The outer shape looks elegant.

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

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.451** Moderate Positive	0.208	0.415**	0.220	0.401**
Plain	0.451**	1	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**	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

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Kansei Features
'plain' & 'beautiful'.
The leave pattern look plain
as it same color as body
paint. .

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.

Design	A	B	C	D	E	F	G
Indicator							

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

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

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

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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.

Figure 4. 22   Design A

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

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** Moderate Negative	0.086	-0.049	-0.026
Self-Spray Button	0.067	-0.044	0.238	0.083	0.102	0.045
Rectangular 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
Decoration 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

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

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

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
Rectangular 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
Decoration 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	-0.155	-0.200

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

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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.

Figure 4. 24   Design C

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

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
Rectangular 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	-0.134	0.186

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.

Figure 4. 25   Design D

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

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

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

Table 4. 25   Number of correlations between Kansei word and Kano model for 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
Rectangular 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	-0.096	-0.068	0.073	0.058	0.036	0.159
Vase Shape	0.002	-0.067	-0.057	-0.196	-0.061	-0.128

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.

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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

Table 4. 26   Number of correlations between Kansei word and Kano model for 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	-0.015	-0.070	-0.165	-0.182
Vase Shape	-0.114	-0.048	-0.139	0.018	-0.043	-0.121

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,

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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

Figure 4. 28   Design G

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

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
Rectangular 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	-0.002	-0.077	-0.023	0.137	-0.159	-0.140
Vase Shape	-0.135	-0.101	-0.112	-0.295* Weak Negative	0.098	0.158

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	B	C	D	E	F	G
Design							
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* / 0.253*			
To Replace the Refill Can			0.253*			
Timer Options						
Wall Hanging		0.273*	-0.371** / -0.278*		-0.260*	-0.269* / -0.285*
Self-Spray Button			-0.292*	0.262*		
Rectangular Shape	0.260*			0.216	0.275*	
Battery Indicator					-0.269*	
Spray Refill Indicator				0.299*		
Decoration Purpose						
Vase Shape		-0.310*		-0.295*		

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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).

Table 4.28 The Result for Kano Question

Product Requirement	A	O	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	I
Timer Options	0	0	4	53	3	2	62	I
Wall Hanging	0	0	8	40	13	1	62	I
Self-Spray Button	0	0	11	38	11	2	62	I
Rectangular Shape	0	0	16	35	8	3	62	I
Battery Indicator	0	0	23	23	12	4	62	M
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

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.
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

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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

$$\frac{A + O}{A + O + M + I}$$

Equation 1. 1 Enhanced Satisfaction Coeffects

Reduced Dissatisfaction Coefficient

$$\frac{O + M}{(A + O + M + I)} \times (-1)$$

Equation 1. 2   Reduced Dissatisfaction Coefficient

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.

Table 4. 29 The Result for CS Coefficient

Product requirement	A	O	M	I	Total	Category	$\dfrac{A+O}{A+O+M+I}$	$\dfrac{O+M}{(A+O+M+I)} \times (-1)$
Timer Setting	0	0	12	3	62	Q	0	-0.8
Charger Battery	0	0	17	18	62	Q	0	-0.48
To Replace The Refill Can	0	0	5	**41**	62	I	0	-0.11
Timer Options	0	0	4	**53**	62	I	0	-0.07
Wall Hanging	0	0	8	**40**	62	I	0	-0.16
Self Spray Button	0	0	11	**38**	62	I	0	-0.22
Rectangular Shape	0	0	16	**35**	62	I	0	-0.31
Battery Indicator	0	0	**23**	**23**	62	I & M	0	-0.5
Spray Refill Indicator	0	0	17	**34**	62	I	0	-0.33
Decoration Purpose	0	0	12	**39**	62	I	0	-0.23
Vase Shape	0	0	9	**38**	62	I	0	-0.19

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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.

Table 4. 30   The morphological chart

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	 Adjustable button	 Button		
Power supply	 AA Battery	 Electric supply	 Rechargeable battery	
Refill can compartment	 Socket	 Flip		

A. Concept 1

Table 4. 31   The morphological chart for concept 1

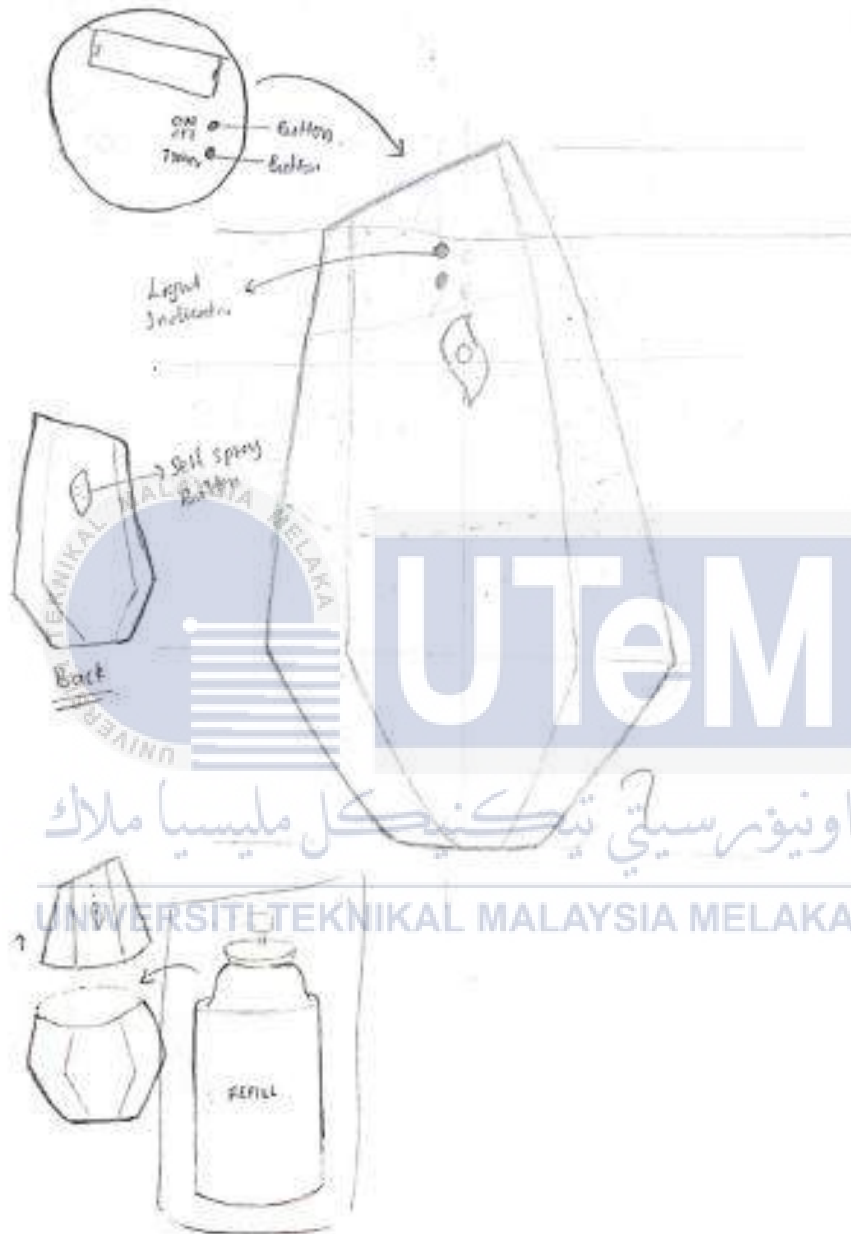| Options Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

Concept 1

Figure 4. 29 Sketching for concept 1

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B.   Concept 2

Table 4. 32   The morphological chart for concept 2

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

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Figure 4. 30   Sketching for concept 2

C.   Concept 3

Table 4. 33   The morphological chart for concept 3

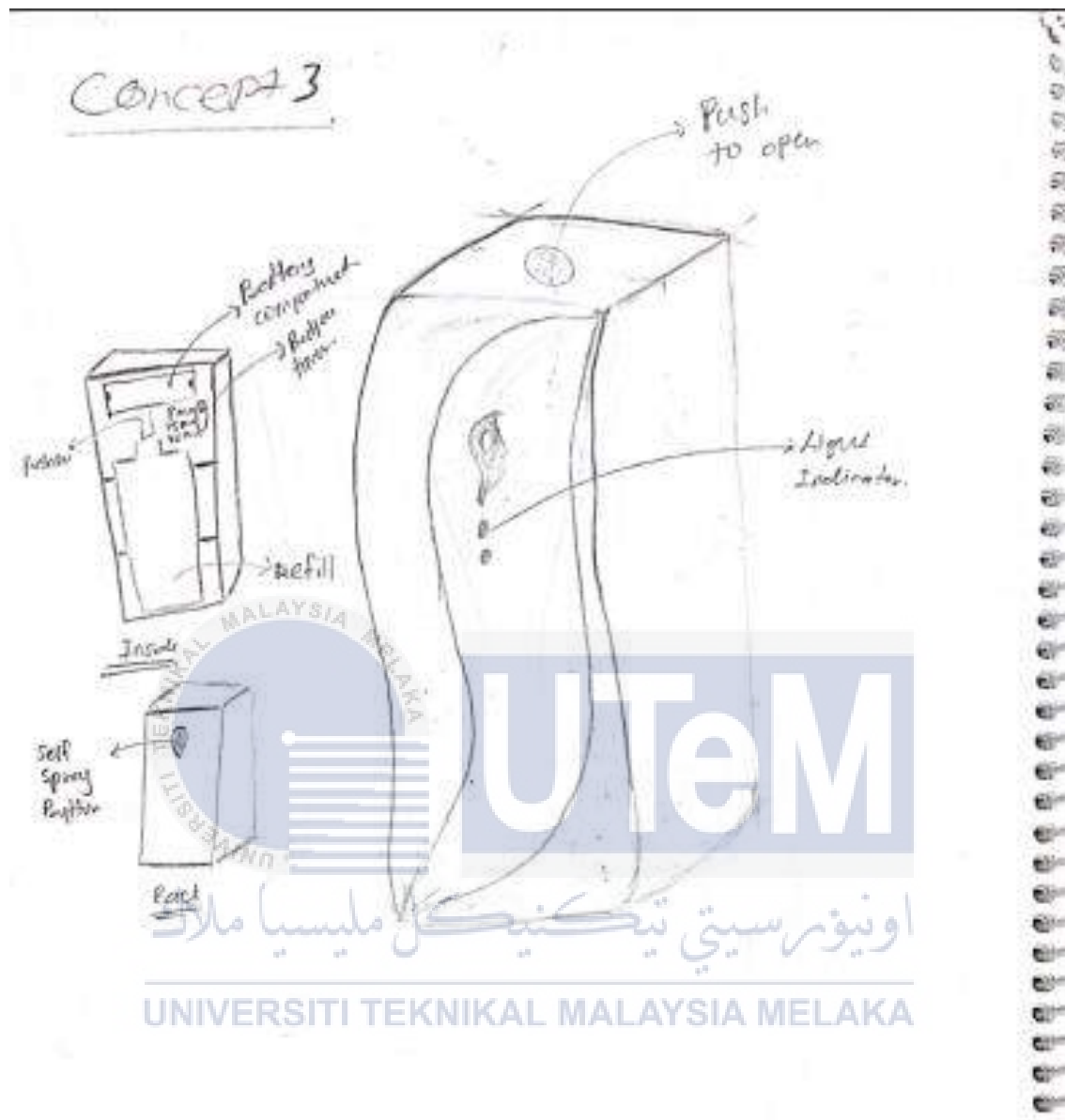| Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

Figure 4. 31   Sketching 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.

Table 4. 34   Pugh method

Criteria	Datum	Concept 1	Concept 2	Concept 3
Body shape	0	+1	+1	0
Nozzle shape	0	0	0	0
Timer Setting	0	-1	0	0
Power supply	0	0	+1	0
Refill can compartment	0	0	0	0
Total		0	+2	0

4.9 Technical Drawing
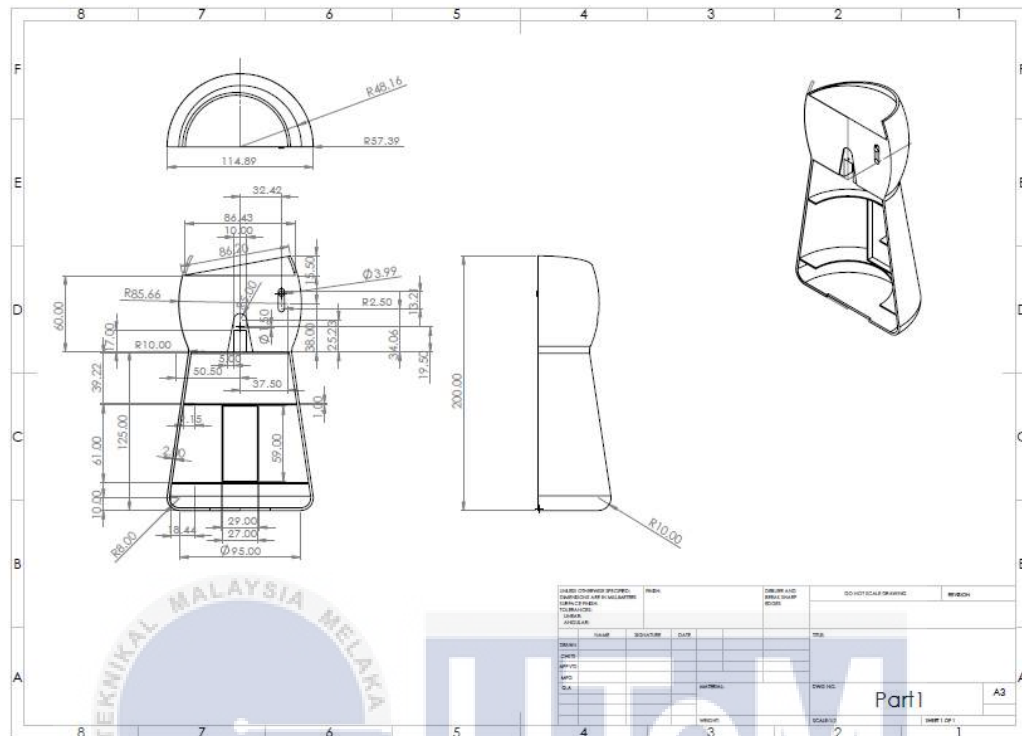

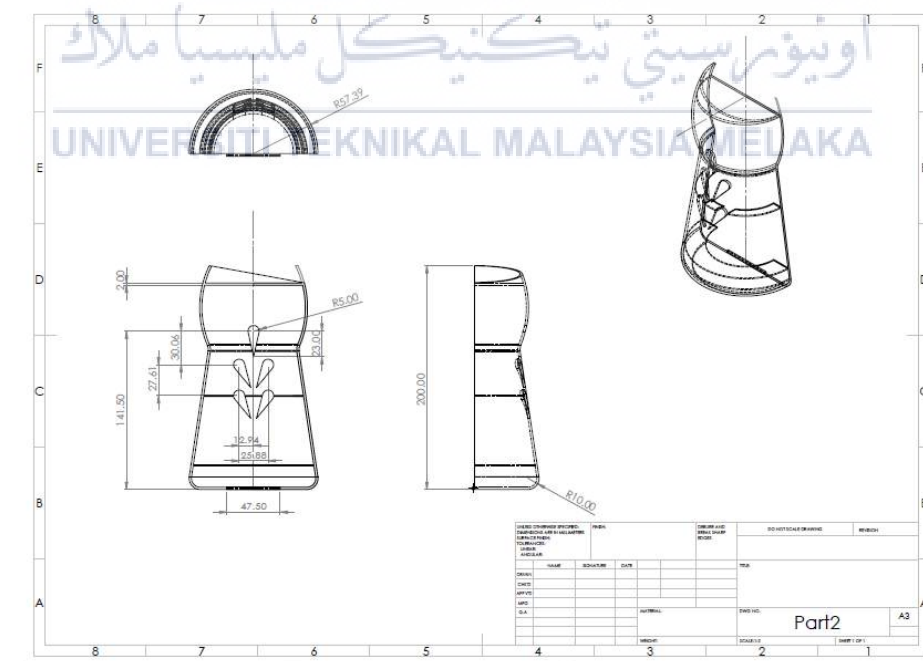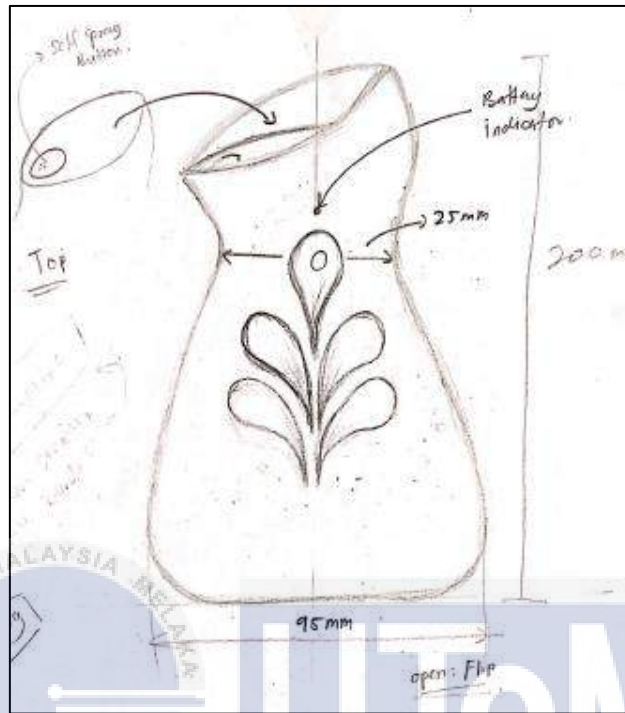Figure 4. 32   Technical drawing of air freshener for body part

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

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4.10   3D modelling Design.

3D modelling is done using SolidWork software.
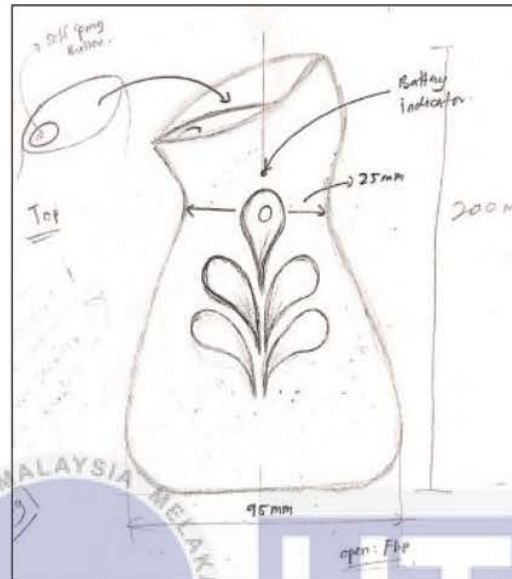
Concept 2 design sketching

Prototype air freshener front.

Prototype air freshener behind view.

Opened Prototype air freshener.

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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

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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.

1. 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.

3. 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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APPENDIX A Gannt chart for PSM 1 and PSM 2.

Activity/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion and verification the tittle and synopsis. Proposal preparation	■														
Student submits proposal to Supervisor and Committee (mind mapping)		■	■												
Identify the problem statement and the objectives			■	■											
Identify scope, objective					■	■									
Define the literature review, introduction							■	■							
Build the flowchart of project (methodology)							■	■							
Submit draft report 1									■						
Draft questionnaire 1 (product selection), distribute										■	■				
Getting data questionnaire 1									■	■	■	■	■	■	
The do correction, submit second draft												■	■	■	■
Draft questionnaire 2 (sentiment survey)							■	■	■	■	■	■	■	■	■
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		■	■												
Distribute the questionnaire			■	■											
Collect data preliminary survey					■	■									
Analyze data (will be used in main survey)							■	■							
Draft Main survey questionnaire (respondents' sentiment towaard product)							■	■							
Distributed main survey									■	■					
Getting data main questionnaire										■	■				
Analyze main survey data										■	■	■	■		
Construct the morphological chart												■	■		
3D modelling product design													■	■	■
Report writing		■	■	■	■	■	■	■	■	■	■	■	■	■	■

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Selection of Product Design Development On Air Freshener

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. 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

SECTION A : DEMOGRAPHY

1. 1. Gender

Mark only one oval.

◯ Female

◯ Male

2. 2. Age

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.

◯ Live 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.
(Tinjauan ini bertujuan untuk mendapatkan pendapat dan pilihan individu ketika memutuskan untuk membeli penyegar udara.
Tandakan di kotak yang mewakili pilihan anda semasa membeli produk.)

Can tick more than 1 box.
(Boleh tanda lebih dari 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.

◯ 0-1

◯ 2-3

◯ 3 and above (3 dan keatas)

5. 5. You prefer to buy air freshener based on (Anda memilih penyegar udara berdasarkan aspek berikut)

LESS IMPORTANT ← 1 2 3 4 5 6 → MOST IMPORTANT

Mark only one oval/ per row.

	1	2	3	4	5	6
Color (Warna)	◯	◯	◯	◯	◯	◯
Scent (Haruman)						
Price (Harga)	◯	◯	◯	◯	◯	
Design (Reka Bentuk)	◯	◯	◯	◯	◯	◯
Brand (Jenama)	◯	◯	◯	◯	◯	◯

6. 6. 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:
KANSEI
WORD

This survey is to get the opinions and feelings of each individual towards air fresheners.
Check the boxes that represent feelings and towards the product.

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

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7. 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 ...)

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

Check all that apply

☐ 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)
- [ ] Bright (Terang)

8. PRODUCT SELECTION

In this section respondent required to mark ONE (1) design of each row of automatic air fresheners product that you prefer. (Di bahagian ini responden dikehendaki menandakan SATU (1) reka bentuk setiap baris produk penyegar udara automatik yang anda sukai.)

8. A *

| | A1 | A2 | A3 | A4 | A5 |

Mark only one oval per row.

	A1	A2	A3	A4	A5
·	○	○	○	○	○

9. B *

| | B1 | B2 | B3 | B4 | B5 |

Mark only one oval per row.

	B1	B2	B3	B4	B5
·	○	○	○	○	○

10. C *

| | C1 | C2 | C3 | C4 | C5 |

Mark only one oval per row.

	C1	C2	C3	C4	C5
·	○	○	○	○	○

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11. D *

| D1 | D2 | D3 | D4 | D5 |

Mark only one oval per row.

	D1	D2	D3	D4	D5
	◯	◯	◯	◯	◯

12. E *

| E1 | E2 | E3 | E4 | E5 |

Mark only one oval per row.

	E1	E2	E3	E4	E5
	◯	◯	◯	◯	◯

13. F *

| F1 | F2 | F3 | F4 | F5 |

Mark only one oval per row.

	F1	F2	F3	F4	F5
	◯	◯	◯	◯	◯

14. G *

| G1 | G2 | G3 | G4 | G5 |

Mark only one oval per row.

	G1	G2	G3	G4	G5
	◯	◯	◯	◯	◯

THANK YOU FOR YOUR TIME

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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 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 Kansei words to explain customer preferences on product design qualities based on Kansei 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.
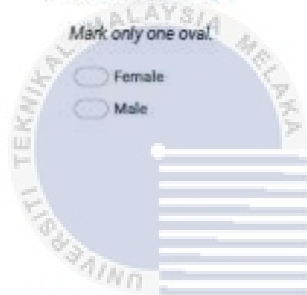
Thank you.

* Required

SECTION 1 : General Information

A: Demography Information

1. Gander (Jantina) *
Mark only one oval.

◯ Female

◯ Male

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2. 2. Age (Umur) *

Mark only one oval.

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

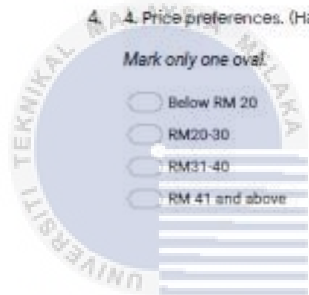3. 3. Occupation Status (Pekerjaan) *

Mark only one oval.

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

B: Product background

4. 4. Price preferences. (Harga) *

Mark only one oval.

- ⬭ Below RM 20
- ⬭ RM20-30
- ⬭ RM31-40
- ⬭ RM 41 and above

5. 5. What are your first preferences toward Air Freshener's casing? (Apakah pilihan pertama anda terhadap sarung Penyegar Udara?) *

Mark only one oval.

- ⬭ Brand
- ⬭ Aesthetics design
- ⬭ Color

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.)

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6. PRODUCT A *

Mark only one oval per row.

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

7. PRODUCT B *

Mark only one oval per row.

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

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8. PRODUCT C *

Mark only one oval per row.

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

9. PRODUCT D *

Mark only one oval per row.

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

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10. PRODUCT E *

Mark only one oval per row.

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

11. PRODUCT F *

Mark only one oval per row.

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

PRODUCT G *

Mark only one oval per row.

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

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SECTION 4: Product Design (Kano Questionnaire)

Step 1

Step 2

Step 4

Step 3

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
I LIKE it that way	It MUST BE that way	I'm NEUTRAL	I CAN LIVE WITH IT that way	I DISLIKE it that way

13. FUNCTIONAL: HOW DO YOU FEEL IF ...... *

Mark only one oval per row.

	1	2	3	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 vase	○	○	○	○	○

9. This section requires you to answer the simple Kano Questionnaire. Please tick the rating as the selected answer.

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

14. DYSFUNCTIONAL: HOW DO YOU FEELS IF ...... *

Mark only one oval per row.

	1	2	3	4	5
The air freshener not having timer setting	○	○	○	○	○
The air freshener using charger battery	○	○	○	○	○
The air freshener complicated to replace the refill can	○	○	○	○	○
The timer setting already have options	○	○	○	○	○
The air freshener cannot hanging on the wall	○	○	○	○	○
The air freshener doesn't have self spray button	○	○	○	○	○
The shape design of air freshener is rectangular shape	○	○	○	○	○
The air freshener doesn't have battery indicator	○	○	○	○	○
The air freshener doesn't have spray refill indicator	○	○	○	○	○
The air freshener design is not suitable for decoration	○	○	○	○	○
The air freshener design do not look like vase	○	○	○	○	○

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Correlations

		K1-timer setting	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	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

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

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Correlations

		K2-charger battery	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	D1_Elegant	D1_Overall
K2-charger battery	Pearson Correlation	1	.022	.046	.101	.036	.003	-.048
	Sig. (2-tailed)		.867	.720	.435	.782	.981	.714
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.022	1	.338**	.320	.325**	.264*	.405**
	Sig. (2-tailed)	.867		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.046	.338**	1	.178	-.037	.186	.342**
	Sig. (2-tailed)	.720	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.101	.320*	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.435	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.036	.325**	-.037	.122	1	.013	.176
	Sig. (2-tailed)	.782	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	.003	.264*	.186	.038	.013	1	.223
	Sig. (2-tailed)	.981	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	-.048	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.714	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

**. Correlation is significant at the 0.01 level (2-tailed).

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Correlations

		K3-to replace therefill can	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	D1_Elegant	D1_Overall
K3-to replace therefill can	Pearson Correlation	1	.219	.208	.253*	.129	.010	.178
	Sig. (2-tailed)		.087	.105	.047	.317	.941	.166
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.219	1	.338**	.320*	.325**	.264*	.405**
	Sig. (2-tailed)	.087		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.208	.338**	1	.178	-.037	.186	.342**
	Sig. (2-tailed)	.105	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.253*	.320*	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.047	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.129	.325**	-.037	.122	1	.013	.176
	Sig. (2-tailed)	.317	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	.010	.264*	.186	.038	.013	1	.223
	Sig. (2-tailed)	.941	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	.178	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.166	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		K3-to replace therefill can	D6_Beautiful	D6_Plain	D6_Classic	D6_Eyecatching	D6_Elegant	D6_Overall
K3-to replace therefill can	Pearson Correlation	1	.197	-.067	.042	-.154	.119	-.122
	Sig. (2-tailed)		.124	.603	.748	.233	.357	.344
	N	62	62	62	62	62	62	62
D6_Beautiful	Pearson Correlation	.197	1	.478**	.611**	.399**	.685**	.620**
	Sig. (2-tailed)	.124		.000	.000	.001	.000	.000
	N	62	62	62	62	62	62	62
D6_Plain	Pearson Correlation	-.067	.478**	1	.120	.415**	.451**	.426**
	Sig. (2-tailed)	.603	.000		.353	.001	.000	.001
	N	62	62	62	62	62	62	62
D6_Classic	Pearson Correlation	.042	.611**	.120	1	.256*	.623**	.539**
	Sig. (2-tailed)	.748	.000	.353		.044	.000	.000
	N	62	62	62	62	62	62	62
D6_Eyecatching	Pearson Correlation	-.154	.399**	.415**	.256*	1	.461**	.631**
	Sig. (2-tailed)	.233	.001	.001	.044		.000	.000
	N	62	62	62	62	62	62	62
D6_Elegant	Pearson Correlation	.119	.685**	.451**	.623**	.461**	1	.628**
	Sig. (2-tailed)	.357	.000	.000	.000	.000		.000
	N	62	62	62	62	62	62	62
D6_Overall	Pearson Correlation	-.122	.620**	.426**	.539**	.631**	.628**	1
	Sig. (2-tailed)	.344	.000	.001	.000	.000	.000	
	N	62	62	62	62	62	62	62

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

NADIAH

by Nur Faresha

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

NADIAH BINTI ZOLKEFLEE
B091810051

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

2021/2022

Faculty of Mechanical and Manufacturing Engineering Technology

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

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

NADIAH BINTI ZOLKEFLEE

**A thesis submitted
in fulfilment of the requirements for the degree of
Bachelor of Manufacturing Engineering Technology (Process and Technology) With
Honours**

Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021/2022

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.

Signature   : ....

Name   : Nadiah Binti Zolkeflee

Date   : ....

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 Bimti Amir Mohamed

Date : ....

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 pre-survey. 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.

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.

ACKNOWLEDGEMENTS

In the Name of Allah, the Most Gracious, the Most Merciful

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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

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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).

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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

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

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

2. 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) .

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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

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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.

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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.

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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

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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

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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,

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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

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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)

Type	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.

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III	Kansei Engineering modelling	• Mathematical modelling with an interference engine and databases
IV	Hybrid Kansei Engineering System	• The combined computer system or forward 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 Engineering Designing	• Group work design system utilizing intelligent software and databases over the internet

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

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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).

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).

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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

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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						Attractive
Ugly						Beautiful
Uncreative						Creative, innovative
Not harmonious						Harmonious
Inclusive						Exclusive
Complex						Simple
Not appealing						Appealing, dazzling
Not Aesthetics						Aesthetics
Not inspiring						Inspiring
Untidy						Tidy
Rigid						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)

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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

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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

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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.

Table 2. 2   List of data collection methods

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

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		in first objective paper (Djatna & Kurniati, 2015).
6	Design in innovative alarm clock made from bamboo	First find the respondent that agree with the 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 pen	The study collected 27 sample of ball pens come from different companies. The 24-respondent female student using 5-point SD scale measurement to evaluate each pen and consist of 40 Kansei words (Nishino, 2010).
9	Kansei engineering approach for consumer ' s perception of the ketchup sauce bottle	The samples were collected from all type of product from different company. 8 type of 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.

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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.

Table 2. 3   Methodology used in 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 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) 2. Cluster weighting factors (design parameter) 3. Aim to optimize the sample of all factors 4. Perform fuzzy evaluation.

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

8	Designing comprehensive ball pen	Multiple linear regression analysis is used to 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 approach for consumer 's perception of the ketchup sauce bottle	In this research used statical tool Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's Test of sphericity. KMO statistic should be 0.6 or greater. Bartlett's Test has a p-value less than 0,0001 showing that there are 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.

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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 5-point 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).

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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 multi-dimensional 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).

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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

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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 eye-catching 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,

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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 well-defined 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

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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

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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

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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

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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.

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

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No	Year	Author	Title	Method	Result	Feature
4	2015	Elokla, Nermin Hirai, Yasuyuki	Evaluation of Assistive Mobility Product for the Japanese Elderly by the Kansei Sheets	Kansei sheet method. Interview and read body language	Result evaluated from interview and result of	Walking stick feature: Soft handle. Adjusting height. Light weight material
5	2015	Djatna, Taufik Kurniati, Wenny Dwi	A System Analysis and Design for Packaging Design of Powder Shaped Fresheners Based on Kansei Engineering	Collect Kansei word from books, journal and internet. Distribute questionnaire	Using Quantification theory type 1 (QTT1)	Tea powder packaging: Bright, modern, simple, and eye catching.
6	2015	Achmad Shergian, Taufiq Immawan	Design of Innovative Alarm Clock Made from Bamboo with Kansei Engineering Approach	Received agreement from 25 respondents who agree with innovation	Using Stuart Maxwell test	Alarm clock feature: Traditional design (which consist of traditional, creative, unique and natural) and Elegant design (which consist of clear, exclusive, artistic, and interesting)
7	2014	Mamaghani, Nasser Koleini Rahimian, Elnaz Mortezaei, Seyed-reza	Kansei Engineering Approach for Consumer's Perception of the Ketchup Sauce Bottle	47 respondents answer the question base on feeling with actual product.	Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and Bartlett's Test of sphericity has been used	ketchup sauce bottle feature: aesthetic, personality, operational, unique and brittle.
8	2015	Djatna, Taufik Wrasiati, Luh Putu	Balinese Aromatherapy Product Development Based on Kansei Engineering	12 Kansei word are getting from interviewing three expert of aromatherapy.	Principal Component Analysis (PCA), Fuzzy Quantification Theory Type 1 (FQTT1).	The development of Bal Indonesian aromatherapy is

No	Year	Author	Title	Sample	Analysis	Findings
		Santosa, Ida Bagus Dharma Yoga	Customer Personality Type	30 customers involve as respondents by answering questionnaire.	statistically quantification method.	more closely linked to consumer personality type.
9	2013	Kato, Toshikazu	Kansei robotics: Bridging human beings and electronic gadgets kansei through engineering	The subject is 4 male students with 5 phases in 1 evaluation by preferred 5 items in 3 times repeated evaluation using questionnaire.	statistically quantification method.	These findings showed that Smart Shop achieved implicit assessment of dominating qualities.(3/4)
10	2010	Nishino, Tatsuo	Kansei Engineering Design of Comprehensive Ball Pen Based on Rough Set Analysis	Respondent 24 female students. 27 vary ball pens. 40 Kansei Word. It is using 5-points SD parameters in questionnaire.	Multiple linear regression analysis	Three final concepts for the design attributes: S-S-S - advance design, E-E-E - advance and young, C-C-C - advance, young and simple.
11	2013	Chuan, Ngip Khean Sivaji, Ashok Shahimin, Mizhanim Mohamad Saad, Nursyakinah	Kansei Engineering for e-commerce Sunglasses Selection in Malaysia	75 respondents (aged 18-34). 30 Kansei word. 20 samples of products.	Factor Analysis (FA) and Principal Component Analysis (PCA), while Partial Least Square (PLS) analysis.	Two color schemes, The color frame: blue, orange or yellow. Frame: half or thin frame.

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.

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PHASE 1

RESEARCH & STUDY ABOUT KANSEI ENGGINERING

PRODUCT SELECTION
(Identify The Product To Investigated)

GETTING PRODUCT SAMPLE
(Determine The Feature Of Product)

PHASE 2

SENTIMENT ANALYSIS EVALUATION
(SPSS)

MAIN SURVEY

SAMPLE ANALYSIS
(Getting Product Information)

PRELIMINARY SURVEY
(Product Selection)

PHASE 3

MORPHOLOGICAL CHART
(Base On Data Evaluation)

SKETCHING NEW MODEL

GENERATING DESIGN
(3D Modelling)

END

Figure 3.1   Full research framework.

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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

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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.

Table 3.1   Kansei word for air freshener's casing.

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

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.

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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 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.

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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 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.

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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

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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.

Figure 3.5   Flowchart for Phase 3

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).

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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	Σ+ signs+Σ- 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

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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.

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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.

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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.

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Table 4. 1   Number of respondents by Gander

Gander	Frequency
Female	36
Male	34
Total	70

Figure 4. 1   Number of respondents by Gander

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.

Table 4. 2   Number of respondents by Age

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

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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

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

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Residence Status

- Live alone
- Live with family
- Live with roommate

20%
21%
59%

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.

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

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

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 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.

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Table 4. 5   Number of respondents according to buyer preference.

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

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.

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Table 4. 6   Number of respondents according to product features

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

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.

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

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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.

Table 4. 7   Number of respondents according to Kansei words

Kansei Word	Frequency
Elegant	30
Trendy	22
Eye Catching	30
Beautiful	38
Grand	26
Plain	33
Old Fashion	32
Dual Colour	26
Modern	23
Multicolour	16
Stylish	20
Easy Handling	18
Attractive	12
Ordinary	6
Unique	9
Simple	3
Bright	6

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

Table 4. 8   Number of respondents according to design

Design	A	B	C	D	E	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

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

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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	Frequency
Female	24
Male	38
Total	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.

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

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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 according to occupation

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

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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

Price Preference

- below RM 20
- RM 20- RM 30
- RM 31- RM 40
- RM 41 and above.

Figure 4. 14   Number of respondents according to price preference

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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

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

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

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

Kansei Features 'Beautiful'

Figure 4. 15   Design A

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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

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

Kansei Features 'Classic'
The outer shape.

Figure 4. 16   Design B

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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 of correlations between two Kansei word for Design C

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	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	1	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

Kansei Features
'elegant' & 'beautiful'.

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.

Table 4. 16   Number of correlations between two Kansei word for Design D

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	0.373**
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

Kansei Features 'Classic'
The color and pattern.

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

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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

Kansei Features 'Beautiful'
The top shape and the pattern

Figure 4. 19   Design E

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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	0.685**	0.451**	0.623**	0.461**	1	0.628**
Overall	0.620**	0.426**	0.539**	0.631**	.628**	1

Kansei Features 'elegant' & 'beautiful'. The outer shape looks elegant.

Figure 4. 20   Design F

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

Kansei word	Beautiful	Plain	Classic	Eye-catching	Elegant	Overall
Beautiful	1	0.451** Moderate Positive	0.208	0.415**	0.220	0.401**
Plain	0.451**	1	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**	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

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Kansei Features
'plain' & 'beautiful'.
The leave pattern look plain
as it same color as body
paint. .

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.

Design	A	B	C	D	E	F	G
Indicator							

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

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

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

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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.

Figure 4. 22   Design A

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

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** Moderate Negative	0.086	-0.049	-0.026
Self-Spray Button	0.067	-0.044	0.238	0.083	0.102	0.045
Rectangular 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
Decoration 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

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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

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

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
Rectangular 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
Decoration 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	-0.155	-0.200

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

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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.

Figure 4. 24   Design C

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

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
Rectangular 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	-0.134	0.186

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

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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.

Figure 4. 25   Design D

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

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

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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.

Figure 4. 26   Design E

Table 4. 25   Number of correlations between Kansei word and Kano model for 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
Rectangular 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	-0.096	-0.068	0.073	0.058	0.036	0.159
Vase Shape	0.002	-0.067	-0.057	-0.196	-0.061	-0.128

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.

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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

Table 4. 26   Number of correlations between Kansei word and Kano model for 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	-0.015	-0.070	-0.165	-0.182
Vase Shape	-0.114	-0.048	-0.139	0.018	-0.043	-0.121

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,

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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

Figure 4. 28   Design G

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

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
Rectangular 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	-0.002	-0.077	-0.023	0.137	-0.159	-0.140
Vase Shape	-0.135	-0.101	-0.112	-0.295* Weak Negative	0.098	0.158

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

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Design	A	B	C	D	E	F	G
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* 0.253*			
To Replace the Refill Can			0.253*			
Timer Options						
Wall Hanging		0.273*	-0.371** -0.278*		-0.260*	-0.269* -0.285*
Self-Spray Button			-0.292*	0.262*		
Rectangular Shape	0.260*			0.216	0.275*	
Battery Indicator					-0.269*	
Spray Refill Indicator				0.299*		
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).

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Table 4.28 The Result for Kano Question

Product Requirement	A	O	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	I
Timer Options	0	0	4	53	3	2	62	I
Wall Hanging	0	0	8	40	13	1	62	I
Self-Spray Button	0	0	11	38	11	2	62	I
Rectangular Shape	0	0	16	35	8	3	62	I
Battery Indicator	0	0	23	23	12	4	62	M
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

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. 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

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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

$$\frac{A + O}{A + O + M + I}$$

Equation 1. 1 Enhanced Satisfaction Coeffects

Reduced Dissatisfaction Coefficient

$$\frac{O + M}{(A + O + M + I)} \times (-1)$$

Equation 1. 2   Reduced Dissatisfaction Coefficient

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.

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Table 4. 29 The Result for CS Coefficient

Product requirement	A	O	M	I	Total	Category	$\dfrac{A+O}{A+O+M+I}$	$\dfrac{O+M}{(A+O+M+I)} \times (-1)$
Timer Setting	0	0	12	3	62	Q	0	-0.8
Charger Battery	0	0	17	18	62	Q	0	-0.48
To Replace The Refill Can	0	0	5	**41**	62	I	0	-0.11
Timer Options	0	0	4	**53**	62	I	0	-0.07
Wall Hanging	0	0	8	**40**	62	I	0	-0.16
Self Spray Button	0	0	11	**38**	62	I	0	-0.22
Rectangular Shape	0	0	16	**35**	62	I	0	-0.31
Battery Indicator	0	0	**23**	**23**	62	I & M	0	-0.5
Spray Refill Indicator	0	0	17	**34**	62	I	0	-0.33
Decoration Purpose	0	0	12	**39**	62	I	0	-0.23
Vase Shape	0	0	9	**38**	62	I	0	-0.19

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.

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Table 4. 30   The morphological chart

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	 Adjustable button	 Button		
Power supply	 AA Battery	 Electric supply	 Rechargeable battery	
Refill can compartment	 Socket	 Flip		

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A. Concept 1

Table 4. 31   The morphological chart for concept 1

Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

Figure 4. 29 Sketching for concept 1

B.   Concept 2

Table 4. 32   The morphological chart for concept 2

Options \ Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

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Figure 4. 30   Sketching for concept 2

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C. Concept 3

Table 4. 33   The morphological chart for concept 3

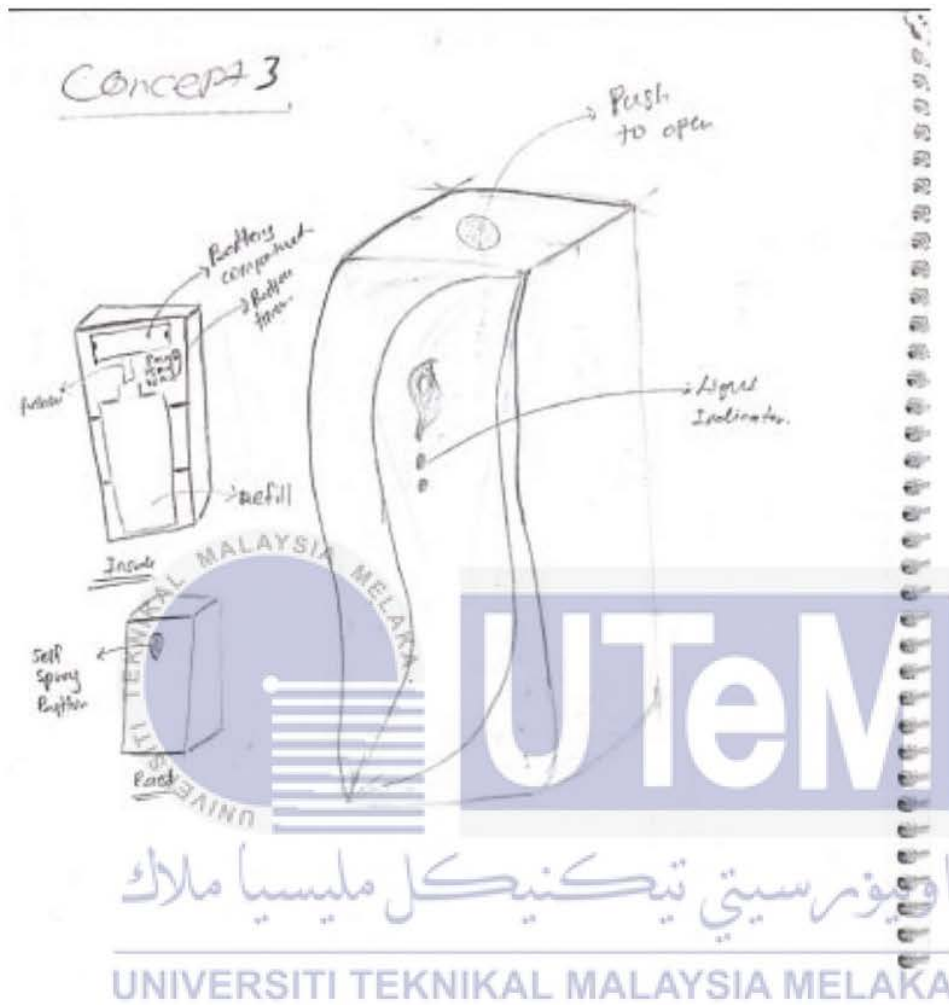| Options / Function	1	2	3	4
Body shape				
Nozzle shape				
Timer Setting	Adjustable button	Button		
Power supply	AA Battery	Electric supply	Rechargeable battery	
Refill can compartment	Socket	Flip		

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	0	0	0	0
Timer Setting	0	-1	0	0
Power supply	0	0	+1	0
Refill can compartment	0	0	0	0
Total		0	+2	0

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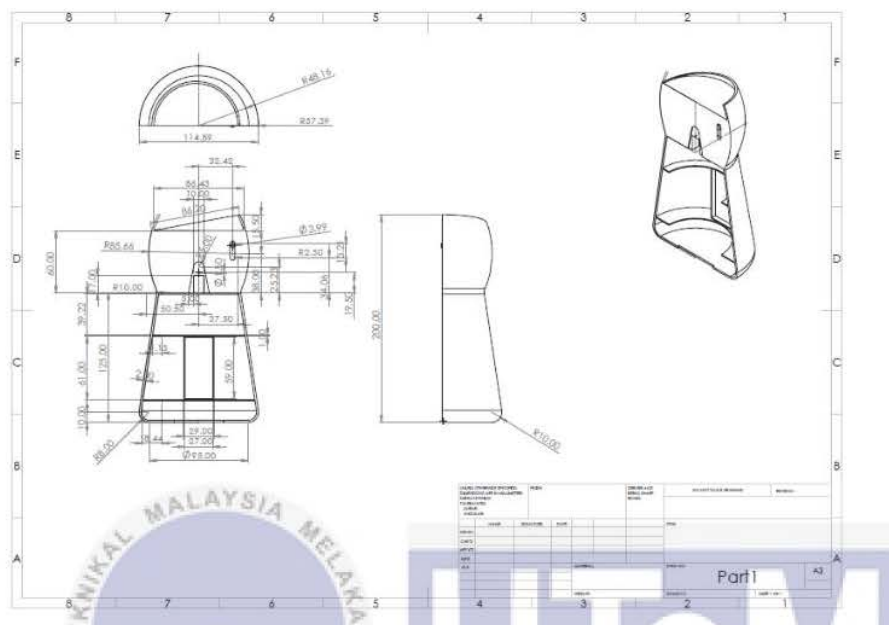## 4.9   Technical Drawing

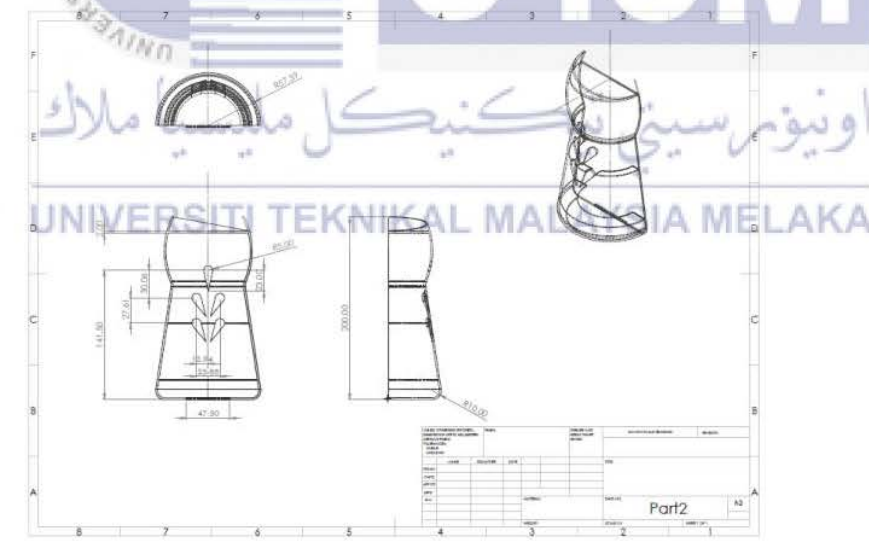Figure 4. 32   Technical drawing of air freshener for body part

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

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4.10   3D modelling Design.

3D modelling is done using SolidWork software.

Concept 2 design sketching

Prototype air freshener front.

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Prototype air freshener behind view.

Opened Prototype air freshener.

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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

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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.

1. 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.

3. 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.
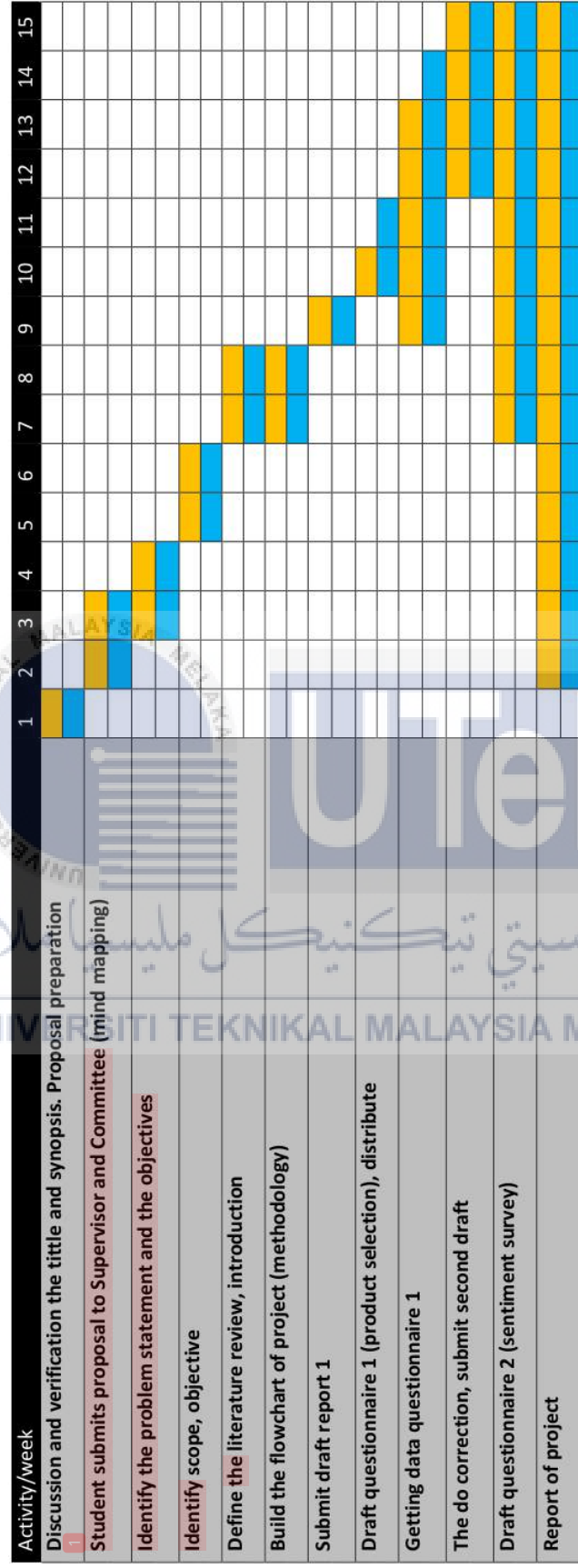
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APPENDICES

APPENDIX A Gantt chart for PSM 1 and PSM 2.

Activity/week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Discussion and verification the tittle and synopsis. Proposal preparation	■	■													
Student submits proposal to Supervisor and Committee (mind mapping)		■	■												
Identify the problem statement and the objectives				■											
Identify scope, objective					■										
Define the literature review, introduction						■									
Build the flowchart of project (methodology)							■	■							
Submit draft report 1									■						
Draft questionnaire 1 (product selection), distribute										■	■				
Getting data questionnaire 1												■	■		
The do correction, submit second draft														■	■
Draft questionnaire 2 (sentiment survey)														■	■
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		■	■												
Distribute the questionnaire			■	■											
Collect data preliminary survey					■	■									
Analyze data (will be used in main survey)							■	■							
Draft Main survey questionnaire (respondents' sentiment towaard product)							■	■							
Distributed main survey									■	■					
Getting data main questionnaire										■	■				
Analyze main survey data									■	■	■	■	■	■	
Construct the morphological chart												■	■	■	
3D modelling product design													■	■	■
Report writing		■	■	■	■	■	■	■	■	■	■	■	■	■	■

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Selection of Product Design Development On Air Freshener

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. 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

SECTION A : DEMOGRAPHY

1. 1. Gander
Mark only one oval.

- ( ) Female
- ( ) Male

2. 2. Age
Mark only one oval.

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

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

Mark only one oval.

- ⃝ Live 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.
(Tinjauan ini bertujuan untuk mendapatkan pendapat dan pilihan individu ketika memutuskan untuk membeli
penyegar udara.
Tandakan di kotak yang mewakili pilihan anda semasa membeli produk.)

Can tick more than 1 box.
(Boleh tanda lebih dari 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.

- ⃝ 0-1
- ⃝ 2-3
- ⃝ 3 and above (3 dan keatas)

5. 5. You prefer to buy air freshener based on (Anda memilih penyegar udara
berdasarkan aspek berikut)

LESS IMPORTANT |←1—2—3—4—5—6→| MOST IMPORTANT

Mark only one oval per row.

	1	2	3	4	5	6
Color (Warna)	⃝	⃝	⃝	⃝	⃝	⃝
Scent (Haruman)	⃝	⃝	⃝	⃝	⃝	⃝
Price (Harga)	⃝	⃝	⃝	⃝	⃝	⃝
Design (Reka Bentuk)	⃝	⃝	⃝	⃝	⃝	⃝
Brand (Jenama)	⃝	⃝	⃝	⃝	⃝	⃝

6. 6. 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:
KANSEI
WORD

This survey is to get the opinions and feelings of each individual towards air
fresheners.
Check the boxes that represent feelings and towards the product.

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

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7. 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 ...)

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

Check all that apply

☐ 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)
- [ ] Bright (Terang)

8. PRODUCT SELECTION

In this section respondent required to mark ONE (1) design of each row of automatic air fresheners product that you prefer. (Di bahagian ini responden dikehendaki menandakan SATU (1) reka bentuk setiap baris produk penyegar udara automatik yang anda sukai.)

8. A *

| A1 | A2 | A3 | A4 | A5 |

Mark only one oval per row:

	A1	A2	A3	A4	A5
	○	○	○	○	○

B *

| B1 | B2 | B3 | B4 | B5 |

Mark only one oval per row:

	B1	B2	B3	B4	B5
	○	○	○	○	○

10. C *

| C1 | C2 | C3 | C4 | C5 |

Mark only one oval per row:

	C1	C2	C3	C4	C5
	○	○	○	○	○

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11. D *

	D1	D2	D3	D4	D5

Mark only one oval per row.

	D1	D2	D3	D4	D5
-	◯	◯	◯	◯	◯

12. E *

	E1	E2	E3	E4	E5

Mark only one oval per row.

	E1	E2	E3	E4	E5
		◯	◯	◯	

13. F *

	F1	F2	F3	F4	F5

Mark only one oval per row.

	F1	F2	F3	F4	F5

14. G

	G1	G2	G3	G4	G5

Mark only one oval per row.

	G1	G2	G3	G4	G5
-	◯	◯	◯	◯	◯

THANK YOU FOR YOUR TIME

APPENDIX C Main Questionnaire

UTeM

اونيۏرسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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 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 Kansei words to explain customer preferences on product design qualities based on Kansei 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.
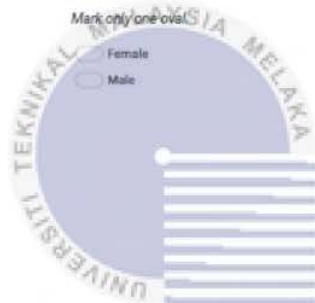
Thank you.

* Required

SECTION 1 : General Information

A: Demography Information

.   1. Gander (Jantina) *

Mark only one oval.

- Female
- Male

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2. 2. Age (Umur) *

Mark only one oval.

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

3. 3. Occupation Status (Pekerjaan) *

Mark only one oval.

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

B: Product background

4. 4. Price preferences. (Harga) *

Mark only one oval.

- Below RM 20
- RM20-30
- RM31-40
- RM 41 and above

5. 5. What are your first preferences toward Air Freshener's casing? (Apakah pilihan pertama anda terhadap sarung Penyegar Udara?) *

Mark only one oval.

- Brand
- Aesthetics design
- Color

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.)

| STRONGLY AGREE | 1 2 3 4 5 6 | STRONGLY DISAGREE |

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6. PRODUCT A *

Mark only one oval per row.

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

PRODUCT B *

Mark only one oval per row.

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

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8. PRODUCT C *

Mark only one oval per row.

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

9. PRODUCT D *

Mark only one oval per row.

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

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10. PRODUCT E *

Mark only one oval per row.

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

11. PRODUCT F *

Mark only one oval per row.

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

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PRODUCT G *

Mark only one oval per row.

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

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SECTION 4: Product Design (Kano Questionnaire)

Step 1   Step 2

Step 4   Step 3

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
I LIKE it that way	it MUST BE that way	I'M NEUTRAL	I CAN LIVE WITH IT that way	I DISLIKE it that way

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13. FUNCTIONAL: HOW DO YOU FEEL IF ...... *

Mark only one oval per row.

	1	2	3	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 vase	◯	◯	◯	◯	◯

9. This section requires you to answer the simple Kano Questionnaire. Please tick the rating as the selected answer.

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

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14. DYSFUNCTIONAL: HOW DO YOU FEELS IF ...... *

Mark only one oval per row.

	1	2	3	4	5
The air freshener not having timer setting	◯	◯	◯	◯	◯
The air freshener using charger battery	◯	◯	◯	◯	◯
The air freshener complicated to replace the refill can	◯	◯	◯	◯	◯
The timer setting already have options	◯	◯	◯	◯	◯
The air freshener cannot hanging on the wall	◯	◯	◯	◯	◯
The air freshener doesn't have self spray button	◯	◯	◯	◯	◯
The shape design of air freshener is rectangular shape	◯	◯	◯	◯	◯
The air freshener doesn't have battery indicator	◯	◯	◯	◯	◯
The air freshener doesn't have spray refill indicator	◯	◯	◯	◯	◯
The air freshener design is not suitable for decoration.	◯	◯	◯	◯	◯
The air freshener design do not look like vase	◯	◯	◯	◯	◯

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Correlations

		K1-timer setting	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	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

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

correlation.spv [Document2] - IBM SPSS Statistics Viewer

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Correlations

Correlations

		K2-charger battery	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	D1_Elegant	D1_Overall
K2-charger battery	Pearson Correlation	1	.022	.046	.101	.036	.003	-.048
	Sig. (2-tailed)		.867	.720	.435	.782	.981	.714
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.022	1	.338**	.320*	.325**	.264*	.405**
	Sig. (2-tailed)	.867		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.046	.338**	1	.178	-.037	.186	.342**
	Sig. (2-tailed)	.720	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.101	.320*	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.435	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.036	.325**	-.037	.122	1	.013	.176
	Sig. (2-tailed)	.782	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	.003	.264*	.186	.038	.013	1	.223
	Sig. (2-tailed)	.981	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	-.048	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.714	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

**. Correlation is significant at the 0.01 level (2-tailed).

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Correlations

		K3-to replace therefill can	D1_Beautiful	D1_Plain	D1_Classic	D1_Eyecatching	D1_Elegant	D1_Overall
K3-to replace therefill can	Pearson Correlation	1	.219	.208	.253*	.129	.010	.178
	Sig. (2-tailed)		.087	.105	.047	.317	.941	.166
	N	62	62	62	62	62	62	62
D1_Beautiful	Pearson Correlation	.219	1	.338**	.320*	.325**	.264*	.405**
	Sig. (2-tailed)	.087		.007	.011	.010	.038	.001
	N	62	62	62	62	62	62	62
D1_Plain	Pearson Correlation	.208	.338**	1	.178	-.037	.186	.342**
	Sig. (2-tailed)	.105	.007		.166	.776	.149	.007
	N	62	62	62	62	62	62	62
D1_Classic	Pearson Correlation	.253*	.320*	.178	1	.122	.038	.393**
	Sig. (2-tailed)	.047	.011	.166		.346	.772	.002
	N	62	62	62	62	62	62	62
D1_Eyecatching	Pearson Correlation	.129	.325**	-.037	.122	1	.013	.176
	Sig. (2-tailed)	.317	.010	.776	.346		.923	.171
	N	62	62	62	62	62	62	62
D1_Elegant	Pearson Correlation	.010	.264*	.186	.038	.013	1	.223
	Sig. (2-tailed)	.941	.038	.149	.772	.923		.082
	N	62	62	62	62	62	62	62
D1_Overall	Pearson Correlation	.178	.405**	.342**	.393**	.176	.223	1
	Sig. (2-tailed)	.166	.001	.007	.002	.171	.082	
	N	62	62	62	62	62	62	62

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		K3-to replace therefill can	D6_Beautiful	D6_Plain	D6_Classic	D6_Eyecatching	D6_Elegant	D6_Overall
K3-to replace therefill can	Pearson Correlation	1	.197	-.067	.042	-.154	-.119	-.122
	Sig. (2-tailed)		.124	.603	.748	.233	.357	.344
	N	62	62	62	62	62	62	62
D6_Beautiful	Pearson Correlation	.197	1	.478**	.611**	.399**	.685**	.620**
	Sig. (2-tailed)	.124		.000	.000	.001	.000	.000
	N	62	62	62	62	62	62	62
D6_Plain	Pearson Correlation	-.067	.478**	1	.120	.415**	.451**	.428**
	Sig. (2-tailed)	.603	.000		.353	.001	.000	.001
	N	62	62	62	62	62	62	62
D6_Classic	Pearson Correlation	.042	.611**	.120	1	.256*	.623**	.539**
	Sig. (2-tailed)	.748	.000	.353		.044	.000	.000
	N	62	62	62	62	62	62	62
D6_Eyecatching	Pearson Correlation	-.154	.399**	.415**	.256*	1	.461**	.431**
	Sig. (2-tailed)	.233	.001	.001	.044		.000	.000
	N	62	62	62	62	62	62	62
D6_Elegant	Pearson Correlation	-.119	.685**	.451**	.623**	.461**	1	.629**
	Sig. (2-tailed)	.357	.000	.000	.000	.000		.000
	N	62	62	62	62	62	62	62
D6_Overall	Pearson Correlation	-.122	.620**	.428**	.539**	.431**	.629**	1
	Sig. (2-tailed)	.344	.000	.001	.000	.000	.000	
	N	62	62	62	62	62	62	62

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

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