NEW PRODUCT DEVELOPMENT: THE PORTABLE DESIGN OF PLANT PACKAGING

THESIS

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AUTHENTICTY STATEMENT

For the sake of Allah, I confess that this research was conducted by me except for the summaries of the sources that have been cited and mentioned. If in the future my confession is proved to be wrong and dishonest resulting in the violence of legal regulation of the papers and intellectual property rights, then I am willing to return my degree I received to be withdrawn by Universitas Islam Indonesia.

Yogyakarta, August 2020

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NEW PRODUCT DEVELOPMENT: THE PORTABLE DESIGN OF PLANT PACKAGING

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NEW PRODUCT DEVELOPMENT: THE PORTABLE DESIGN OF PLANT PACKAGING

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DEDICATION

This thesis is wholeheartedly dedicated to, my beloved parents Mami Sulastri and Bapace Ranto, Mbah Kakung, Mbah Uti, all of my big family ROSWI and to the growth of Indonesian UMKM business fighters.

MOTTO

The Prophet sallallaahu'alaihi Wasallam said:

خَيْرُ الناسِ أَنْفَعُهُمْ لِلناسِ

"As Good as Humans Are the Most Beneficial For Others”

PREFACE

Assalamu'alaikum Warahmatullaahi Wabarakatuh

Alhamdu lillahi rabbil 'alamin, all praise to Allah SWT, with His unconditional blessings so, the author can complete this undergraduate thesis. Highest gratitude to all parties who give the author supports and motivations so the author can get through all process in making this undergraduate thesis, which are:

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3. Head of Department of Industrial Engineering, Faculty of Industrial Technology UII.
4. Head of Undergraduate Program Department of Industrial Engineering, Faculty of Industrial Technology UII.
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Finally, the Author realizes that there are still shortcomings as well as weaknesses in this report, so the building suggestions and critics are fully expected. The author hopes this paper would bring advantages for everyone who reads this.

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Nurman Gesit Rianto

ABSTRACT

Indonesia has abundant natural wealth with the largest forest in the world that has various kinds of flora and fauna. In Indonesia, in the last 10 years, the term agribusiness has become a common and widespread term. A company's advantage from other companies can be obtained from innovative packaging. This study is aimed to create a new product in the form of packaging to package plants in the delivery system of plants which is expected to be a solution to the problems that arise in the process of plants shipping, which is caused by the unmet needs of respondents (plant seller) in the process of sending plants related to the packaging. This research begins by finding out what problems are encountered by the respondents (plant seller) when the respondents send their product in the form of plants to their consumers, then the problems will be analyzed to find out what are the respondents' needs to overcome the problems. Questionnaires were distributed to 20-30 respondents to dig up information about what problems that respondents experienced in the process of sending plants and what are the needs of the respondents that haven't been met that cause existing problems. The respondents' needs then translated using the Kansei Engineering method into 27 Kansei words. The 27 Kansei words are then be eliminated using a statistical method by conducting a semantic differential 1 questionnaire distribution, followed by a sufficiency test, validity test and reliability test using IMB SPSS ver.25.0. After being eliminated, 27 Kansei words have been reduced to 11 Kansei words which according to the results of the calculation of the 11th Kansei word using reliability test and Validity test in IMB SPSS ver.25.0 are declared as valid and reliable. The 11 Kansei words are then analyzed, translated, and broken down into elements and specifications by holding discussions with the respondents and then the specifications will be used as specifications to create a new product design of plant packaging as a form of the needs of the respondents that expected to be able to be solutions to the problems that arise in the process of sending plant in the form of plants that related with packaging.

Keyword: *Customer's Needs, Kansei Engineering, Packaging, Plant Seller, Solution.*

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CHAPTER I

INTRODUCTION

1.1 Background

Indonesia has abundant natural wealth with the largest forest in the world that has various kinds of flora and fauna. As a vast archipelagic country composed of about 13700 large and small islands, Indonesia has a rich diversity of flora and fauna species. It is estimated that there are about 100 to 150 plant families grown in Indonesia, and most of them can be utilized for industrial plants, fruit crops, spices, and medicinal plants (Lestari, 2016).

In Indonesia, in the last 10 years, the term agribusiness has become a common and widespread term (Saragih, 2010). Not as popular and lively as in 1995-2004, but the term agribusiness has been there before and has been included in the third edition of Indonesian big dictionary 2005 edition by the Indonesian language developer center which means the word agribusiness has officially become a general term in Indonesia (Saragih, 2010).

Business areas from new product development to sales and service support, from the provision of market intelligence to the provision of tools for decision analysis on organizational processes are run by using information technology (Nasution, 2015). In the modern era, the internet has become an integral part of modern society. Not only change the way of thinking, the internet has also brought a new perspective on the business world that leads to the birth of e-commerce, e-business, and others (Nasution, 2015).

Currently, an Online market that can be accessed by anyone anywhere has dominate and shifted the traditional market. Any online transactions can be done such as purchase transaction and material order up payment. In the early use, the internet is only used for promotional purposes and advertising through the website, but over time the internet has changed function into multifunctional, either as a means of promotion, purchasing goods, selling goods, and selling service. E-commerce is a tool that meets the needs of companies, consumers, and management to cut service costs when improving the quality of goods and improve the speed of delivery services if viewed from a service perspective. Companies can interact with their business partners from far away in the other city even abroad and the companies can also serve consumers faster regardless the distance with shorter time due to internet use. Selection of production sites and customer service can be easily done by the manufacturer. Companies in low-income countries can spend less cost to access information and make business contacts. (Nasution, 2015).

A company's advantage from other companies can be obtained from innovative packaging. In the packaging, one thing to note is the consistency of the packaging in some cases such as advertising, pricing, and product distribution. Some packaging designs are usually taken into consideration by the company for its new product. The things that should be consider by company for the packaging design are to find the best in normal use, the easiest to handle by the dealer, and to receive opinions from customers for the most interesting packaging as their favorite packaging. The four main functions that should be fulfilled by a packaging are to accommodate and protect products, promote products, and facilitate storage, use, and convenience of products and the last one, which is considered as important is to facilitate recycling process and to reduce environmental damage. (Abdalkrim & AL-Hrezat, 2013).

Based on questionnaire that was distributed from 21st October 2018 until 4th November 2018 to 30 online sellers from Facebook, Instagram, OLX, and offline plant sellers that have performed packaging for their goods due to their distribution that covers costumers from all over Indonesia. It is found that there are 73.3% of sellers experienced loss that caused by the packaging of their goods.

It later could be resumed the causes of loss, from the perspective of the sellers, which are 53.3% sellers think that the cost of packaging are too expensive, 53.3% sellers blame the packaging process time, 46.7% sellers presume less strength of packaging, 33.3% seller think it is due to less interesting packaging, 20% sellers think, it is due to the packaging that is not environmentally friendly, 43.3% sellers think it is due to unpractical packaging, 53.3% sellers think it is due to the weight of the packaging that leads to more expensive delivery cost, 33.3% sellers think it is because the packaging process that needs so much effort, 30% sellers think it is due to the packaging that needs much materials, 26.7 sellers think it is due to the packaging needs more tools and 3.3% sellers think that the packaging are too big in its dimension. the material that used by seller are, 93.3% cardboard, 40% wood, 23.3 sacks, 26.7 paper, 6.7% Styrofoam, 46.7% plastic bag, 16.7 % bamboo, and 3.3% bubble wrap, Dacron (kinds of feather) and *atum* (kinds of plastic).

So, it can be said that recently in Indonesia, packaging for plants mostly uses packaging in the form of wood, which takes a lot of cost and time, sacks that are not environment friendly, simple cardboard with open positions that has risk of damaging the plant, and other simple packaging that do not have more aesthetic values to attract and satisfy the customers with the appearance. It can be concluded that the plant packaging in Indonesia at this time only pay attention to the arrival of plants to consumers so the other factors that cause losses such as lost funds due to issues in packaging, the influence of packaging type on the environment after using, plant damage due to improper packaging, lack of interest of customers to re-order due to the usual packaging and the difficulty of packaging process that causes the longer time for packaging process, are not considered by both shipper and customers.

Kansei Engineering aims to produce new products based on consumer feelings and requests. There are four points related to this technology; (1) how to understand consumer feelings (Kansei) about products in terms of ergonomic and psychological estimation, (2) how to identify product design characteristics of Kansei consumers, (3) how to build Kansei

Engineering as an ergonomic technology, and (4) how to adjust design products with current community changes or trends in people's preferences (Nagamachi, 1995).

Therefore, the solutions should be provided to reduce the losses incurred in the process of goods delivery by creating new products for plants packaging by using Kansei Engineering method, which also determine as the goals of this research.

1.2 Problem Formulation

Based on the background above, the problems that should be formulated and generated are shown below:

1. What are the attributes in the packaging design that are needed to fulfill unmet needs of plant sellers?
2. What are the design parameters and suitable specification that must be available in the packaging design for plants in order to fulfill the unmet needs of plant sellers?
3. How valid the new design of packaging to fulfill the unmet needs of plant sellers?

1.3 Objectives

Based on the problem formulation above, the research objectives are as follows:

1. Find out the proper attribute of packaging design that are needed to fulfill unmet needs of plant sellers.
2. Find out the design parameters and suitable specification that must be available in the packaging design for plants in order to fulfill the unmet needs of plant sellers.
3. Develop the new packaging design that valid to fulfill the unmet needs of plant seller.

1.4 Research scope

The research scope has a function to limit the research in order to make the research stay focus on the study. Below is the research scope:

1. The research is being conducted in Facebook Online Forum, Instagram, OLX and Indonesian Offline plant seller that involve the packaging for their plant due to delivery.
2. The respondents are online and offline plant sellers.
3. Developing the packaging for any transactions that need to package its plant.
4. The design of packaging is fixed, while the size of packaging is customable depends on the size of plant
5. This research excludes the construction of specific material
6. This research material are originated from the easiest to find material that commonly can be found in respondent area based on respondent reference.

1.5 Benefits of Research

The benefit of research as follows:

1. For Plant Seller

This research will provide the suitable packaging that seller need due to smooth delivering process to customers, in its objective to fulfil customer's needs.

2. For Researcher

This research enhances researcher's insights and knowledge on developing new product, to provide dynamic customers' need and as one of the requirements to pass bachelor degree.

1.6 Systematical Writing

The thesis writing is based on the rules of scientific writing in accordance with the systematics as follows:

Chapter I includes introduction. This chapter contains a preliminary description of research activities, on the background of the problem, formulation of the problem, the objectives to be achieved, the benefits of research and systematic writing.

Chapter II involves literature. This chapter elaborates the theories on the reference books and journals as well as the results of previous researches related to the research problem which is used as reference for problem solving.

Chapter III contains research methodology. It comprises the description of the framework and lines of inquiry, the research object to be studied and the methods used in the study.

Chapter IV comprises collection and data processing. It Contains the data obtained during the research and how to analyze the data. Data processing result is displayed either in the form of tables and graphs. Data processing also includes analysis of the results obtained. This section will be the reference for discussion of the results to be written in Chapter V.

Chapter V includes discussion. It discusses the results of data processing that has been done in research. Compatibility with the objectives of research so as to produce a recommendation.

Chapter VI reveals conclusions and recommendations. It contains the conclusion of the analysis made and any recommendations or suggestions based on the results of the research, designated for future studies.

Last chapter contains References and Attachment.

CHAPTER II

LITERATURE REVIEW

2.1 Empirical Study

(Taufik & Kuniati, 2015) Conducted a research entitled "A system analysis and design for packaging design of powder shaped freshener based on Kansei Engineering". The reason for this research was held, because currently tea powder still using traditional packaging that cannot compete with the other international competitors. To support customers' preferences and increase the sales, the packaging should be attractive. The objective of this research is to identify the elements of packaging design, identify packaging design with Kansei word, and formulate the new packaging design. Kansei Engineering is used to create a newly invented product in order to connect the desire product characteristic for customer's perception. After collecting 20 questionnaires of Kansei word from customers, it is found 12 suitable Kansei word. After calculation is conducted by using TF-IDF from Hypothetical data of questionnaire, there are top 4 as the highest Kansei word, in terms of weight, which are bright, modern, simple, eye-catching. It could be employed as the strategy for developing the packaging design of tea powder product. Finally, the formulation of new packaging design is resumed by involving eye-catching that actualized with the element of color (green), image (cup), typography (custom), and shape (attractive), which has the highest R2 and fits with the statistical model, very important, and recommended.

(Mohamed & Mustafa, 2014) conducted a research entitled “Kasei Engineering Implementation on Car Center Stack Design”. The reason why this research is held due to the emotionally appealing design that is currently becomes the norm of customers product that also includes interface. So, the designer follows the same trend to be applied to the car interior design as a competitive effort for their car. Above explanation is determined as the objective of the research. one of the tools in this research is Kansei Engineering. Kansei Engineering on this study was applied to determine the tangible design needs of young Malaysian adult for car center stacks. After distributing the questionnaire of Kansei word to 30 young Malaysian adults between ages 18 to 30, 12 Kansei words that were minimalized from 17 Kansei word. Partial Least Squares in MINITAB software is used to analyze the data. The result of this research shows that Chevrolet Aveo center stack design was the most preferred by both male and female while the least preferred design was Honda Fit for the female with (3.75/10) rating and Volkswagen Polo for the male with rating of (4.06/10).

(Annisa & Surya, 2017) conducted a research entitled "Proposed Design of tamarind Product Packaging Using Kansei Engineering Method". This research was carried out because all this time the packaging was only used to protect the goods and make things easier to carry. Packaging nowadays supposed to do many sales tasks ranging from attracting customer attention, describing the product, to selling it. Kansei Engineering was used in this study because Kansei Engineering was the most suitable method, since Kansei Engineering is applied based on the feelings of consumers who buy and consume the product. After distributing 25 questionnaires to 25 tamarind consumers in Tambilahan sub-district, each respondent had the opportunity to choose 10 desired Kansei words that were expected to be on the packaging. After going through several stages of elimination of the Kansei word, the final Kansei word leaves 5 words which will be applied in the tamarind packaging design that will be made. The selected 5 Kansei words are attractive colors, not tacky, bright and patterned weighted as 12.4%, distinctive, character, easy to remember, unique, different from the others weighted as 14.4%, clear packaging pictures, tamarind picture, as long as the picture describes food weighted as 14.4%, informative, the telephone number of the manufacturer, the net weight, the expiration date, there is composition. The existence of brands weighted 25.2% and the existence of halal logo is weighted as 8.4%.

While the remaining 25.2% are influenced by other factors. Based on the results of the questionnaire, it was found that there was an increase in the value of new tamarind packaging which was made based on the Kansei Engineering method by 33.93% if compared to the old packaging

(Putra, Martini, & Iqbal, 2017) conducted a research entitled "Supermarket Trolley Design Using the Implementation of Kansei Engineering Method". This research was conducted due to the complaints from customers towards the available trolleys. Therefore, the existing supermarket trolleys should be redesigned to reduce the complaints or to eliminate the complaints One method used in this research is Kansei Engineering. The first stage carried out by researchers in this study was to collect Kansei word. Using a questionnaire that targeted to the users aged 24-65 years, researchers get 20 Kansei words. The next step is to distribute a semantic differential questionnaire to determine the priority scale of the word system that has been determined. After the results of the semantic differential are revealed, the next step is to test the reliability and validity of Kansei word. From the test, word of Kansei that is declared reliable and valid will be made as a new design concept from the supermarket trolley. The next step conducted by the researcher is to do a factor analysis which aims to classify Kansei word, to facilitate the process of making a new product concept. Next, the researcher uses the tree structure as it was applied to Kansei type 1 to find out specifications such as size, features, material, structure, and mechanism. After the specifications are found, the new supermarket trolley model is designed using a CAD application.

(Shergian & Immawan, 2015) conducted a study entitled "Innovative Alarm Clock Design Made from Bamboo with Kansei Engineering Approach". This research was conducted because the researcher think that previously *otok otok* traditional games and alarm clock were very popular in the market but, nowadays both products experienced a decline in catching people's enthusiasm. Therefore, by creating product innovations in the form of a bamboo-made alarm clock, it is expected to be a solution for the decline in customer interest for the *otok otok* traditional games and alarm clock. Kansei Engineering is one

of the methods that used in this study. Kansei Engineering is used because the researcher think that Kansei Engineering is the method that used to convert feelings and imagination of customers into parameters of a design. The first stage that is carried out by researcher is collecting Kansei word from 25 respondents. After conducting reliability and validity tests, as many as 8-word criteria were found and grouped into 2 factors using factor analysis and named factor 1 and factor 2. Kansei word Traditional Design was taken as the basis of the design specification for the final design from factor 1 because Traditional Design Word has a loading factor that is greater than creative, unique and natural, while from factor 2 the word Kansei taken is Elegant because the Word clear and exclusive has almost the same loading factor. Then the last step is to do the mapping process to determine the physical design of innovative alarm clock based on selected Word Case, namely Traditional Design and Elegant Design

(Khean, Sivaji, Shahimin, & Saad, 2013) conducted research entitled "Kansei Engineering for e-commerce sunglasses selection in Malaysia" this research was conducted since according to researcher, in the process of buying and selling online sunglasses in Malaysia, customers cannot directly touch and feel the glasses they are interested in, which means that the physical presence of the sunglasses product becomes more important than the customer's decision to buy the sunglasses themselves. To encourage the sale of sunglasses, it is necessary to increase emotional or Kansei generated attractiveness. Kansei Engineering is one of the methods that used in this research. Kansei Engineering in this study is used to identify the design of sunglasses that are emotionally attractive to Malaysians aged 18 to 34 years. The first step that was carried out in this study was to search for Kansei word which was obtained from sunglasses advertisements and promotional articles and then 30 Kansei words were found. In addition, researcher also verified Kansei word with Optometrists from the National University of Malaysia before conducting an evaluation experiment. The next step in this research is to collect specimens and later 20 specimens are obtained. Then each item is classified and made for each category and proceed with statistical analysis. The results of this study indicate that sunglasses with the light-colored thing or half frame with the overall color count of two to be the most emotionally attractive design while the color of blue, orange, and yellow are statistically more attractive.

(Janari & Rakhmawati, 2016) conducted research entitled "Developing Baby Bag Design by Using Kansei Engineering Method". The purposes of this research is to create a baby bag product as stipulated by Kansei. Kansei Engineering is one of the methods used in this study because Kansei word is illustrated as a human's psychological feeling. The first stage in this study is to determine the design of baby bags. It aims to identify basic needs and specification details for users. The next step is to identify Kansei word. Kansei word in this study is obtained by direct interview. 22 Kansei words which represents the feelings of the respondents for a baby bag are given to the respondent and after calculation, it is selected 18 Kansei word. The researcher then conducts a data collection for questionnaire 1 was distributed to 40 women as respondents and aimed to identify the initial consumer's preferences on design, function, and material of baby bags. After doing the data collection for questionnaire 1, the data collection for questionnaire 2 is done to recognize the relationship between Kansei word and categorization of design elements. After that, the next step in this study is to identify design elements with Kansei word using statistical models. The last step in this study is data collection by using questionnaire 3 designed to identify the relationship between Kansei word and category of design elements of bottle's pocket, space for clothes, bottle's heater pocket, space for diapers, top grip, side grip, and shoulder grip, whether they meet the consumer's preferences. Questionnaire 3 is used to recognize the selected model of the design's categorization that fits the Kansei words. The final result of this study is that the results of the selection of baby's bag design for questionnaire 3 are resumed as follows; space for clothes, space for baby's diaper, baby's bottle is referred to design 1, space for clothes, design for top grip and side grip are referred to design 2, shoulder grip is referred to design 1, space of clothes is referred to design 3, bottle's heater is referred to design 1, space for baby's diaper, space for clothes are referred to design 4, shoulder grip is referred to design 2, space for clothes is referred to design 3, shoulder grip, side grip is referred to design 1, top grip is referred to design 2, bottle's pocket, bottle's heater pocket are referred to design 1.

2.2 Theorical Study

2.2.1 New Product Development

(H.Loch & Kavadias, 2008) NPD covers a large number of topics and challenges within a company, such as strategy formulation, deployment, resource allocation, and coordinated collaboration between people of various professions and nationalities, and systematic planning, monitoring and control. In light of that, NPD has long been an important topic for several business research disciplines, of course economics, marketing, organizational theory, operations management, and strategy.

(Ulrich & Eppinger, 2004) NPD is a 'series of activities that begin with the perception of market opportunities and end in the production, sale and delivery of a product.' With a little modification, this definition also includes the development of new services (NSD): different from the products produced, services are produced together with customers, and therefore, the NSD must include a customer interface mechanism. However, this definition focuses on individual new products, while NPD activities in larger companies must consider the flow of various ideas and products, selection between them and their evolution from generation to generation.

(H.Loch & Kavadias, 2008) make the perspective more explicit, New product development (NPD) consists of company activities that lead to the flow of market offerings for new products or that change over time. These include opportunity generation, their selection and transformation into artifacts (products produced) and activities (services) offered to customers, and institutionalizing improvements in NPD activities themselves.

The definition implies that the NPD system has three fundamental elements: variant generation, selection, and elaboration with inheritance. We add one element that does not follow the definition of evolution but is the result of evolution among higher animals that solves the most complex adaptive problems: NPD activities are

distributed always (except in very small companies) through many parties. In parallel with higher animals (such as social insects, large marine mammals, and primates), the problem solved by NPD is too complex for small groups to do. Therefore, we add NPD elements that ensure coordination and exchange between parties.

The basic element of developing new products

1. Process generation variants, which identify new combinations of technology, processes, and market opportunities with the potential to create economic value. Variants are produced by directed search and a 'blind' combination of unrelated elements (creativity).
2. The selection process, which chooses the most promising among new combinations for further investment (financial, managerial, physical, and / or human resources) according to consistent criteria.
3. The process of transformation, which changes ('develops') opportunities into economic goods and codified knowledge (contained in the design) - products or services that will be offered to customers.
4. The coordination process, which ensures the flow of information, collaboration, and cooperation among many parties involved in NPD activities.

While the elements of the NPD system follow the fundamental logic of evolution, they appear in various forms and forms in different organizations. Thus, NPD research has also been carried out with many different theoretical lenses and study approaches. In the remainder of this chapter, we try to argue that the theory of evolution can represent the basic functions of NPD elements, while including a variety of variant generation mechanisms, selection criteria (for example, driven by market conditions and stakeholder gathering), and transformation and inheritance rules (eg, reflecting technical constraints).

2.2.2 Kansei Engineering

(Nagamachi, 1995) Kansei Engineering was developed as a consumer-oriented technology for the development of new products. This is defined as "translating feeling technology and consumer images for a product into a design element". Kansei Engineering (KE) technology is classified into three types, KE Type I, II, and III. KE Type I is a category classification on new products for design elements. Type II uses current computer technology such as Expert Systems, Artificial Neural Network models and Genetic Algorithms. Type III is a model that uses mathematical structures.

Kansei is a Japanese word that means consumers' feelings and psychological images of new products. When a consumer wants to buy something, he has a product image as "luxurious, beautiful and strong". Kansei Engineering technology allows images and feelings to be used in new products. Kansei Engineering is defined as "the technology of translating consumer feelings (Kansei in Japanese) from products to design elements, as shown in figure 2.1.

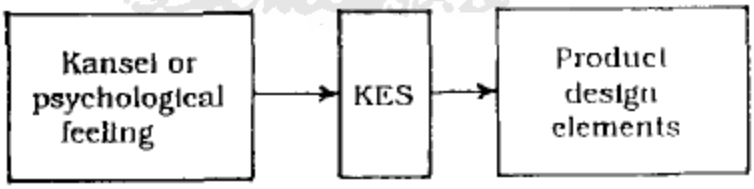


Figure 2.1 From Product to Design Element

Kansei Engineering aims to produce new products based on consumer feelings and requests. There are four points related to this technology; (1) how to understand consumer feelings (Kansei) about products in terms of ergonomic and psychological estimation, (2) how to identify product design characteristics of Kansei consumers, (3) how to build Kansei Engineering as an ergonomic technology,

and (4) how to adjust design products with current community changes or trends in people's preferences.

Regarding the first point, Semantic Differential (SD) developed by Osgood and his colleagues is used as the main technique for understanding Kansei consumers. At Kansei Engineering, the customers or Kansei feelings are originated from stores that sell and from industry magazines. First, 600 to 800 Kansei words are collected and then 100 of the most relevant words is selected.

Regarding the second point, a survey or trial is carried out to see the relationship between Kansei words and design elements. Regarding the third point, advanced computer technology is employed to build a systematic framework of technology on Kansei Engineering. Artificial Intelligence, Artificial Neural Network Models and Genetic Algorithms, and Fuzzy Logic, are used in the Kansei Engineering System to build related databases and computerized inference systems. Finally, we were able to adjust the Kansei Engineering database with new Kansei consumer trends by entering new Kansei data from consumers every three or four years.

1. Kansei Engineering Type 1

(Nagamachi, 1995) Category Classification is a method in which the Kansei product category is broken down in a tree structure to get design details. The following is a good example of the application of the Kansei Engineering Type I. A Japanese automaker, Mazda, has developed a new sports car called "Miyata" originating from Kansei Engineering. Nagamachi teaches Kansei Engineering to Mazda. Chairman, Mr. Kenichi Yamamoto has a lot of interest in this new ergonomic technology. Since then, at Mazda, Kansei Engineering has become the basic technology for new product development.

Mr. Hirai, a manager for new cars, decided to implement Kansei Engineering in the development of "Miyata" and set a zero-level category from the new car "Human - Engine and Unity (Jinba-Ittai in Japanese)" after discussions with his project team. This concept implies that a driver feels the union between himself and the car when driving. The driver feels that his body might be a car and control the engine with his own intentions freely. Humans - Unity machines are just new car concepts and do not tell anything about car designs such as engine characteristics, car size and so on. In Kansei Engineering Type I, the concept of zero level must be broken down into clearly meaningful sub conceptions to get detailed design.

The members of the project team began to classify the concept of zero levels into sub-concepts, namely, 1, 2... and sub-concepts until they get the car design specifications. The Type I procedure is shown in Figure. 2.2.

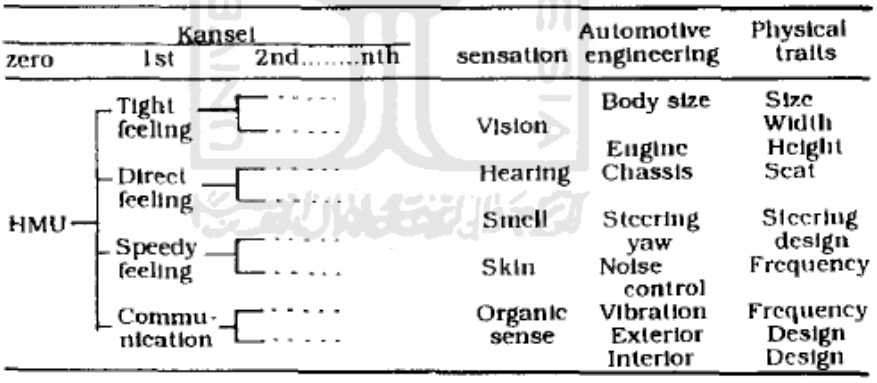


Figure 2.2 Kansei Type 1 Procedure

(Nagamachi, 1995) Regarding "Miyata", the zero Kansei level is classified into four sub conceptions at level 1; "Tense feelings", "Direct feelings", "Fast feelings" and "Communication". "Tight-feeling" implies "fits tightly with the machine" and "not big or small".

With this sub conception, the team decided that the length of the car would be around 4 meters and become 3.98 m after discussing the length of the chassis. When they put four seats in the car, the consumers' feelings are "narrow" and this sub conception does not match "Tense". So, the team designed a car that was installed with two sheets.

(Nagamachi, 1995) explains how the Type I procedure for transferring sub concepts to design details, as shown in Figure. 2.3 illustrates the part of the flow with respect to "Strictness". If the team cannot get detailed design, it must continue with the 2nd classification, 3, …nth. level. When teams are fully aware of car design spots, they carefully examine design details in terms of automotive engineering. At this stage, the team created many new patents.

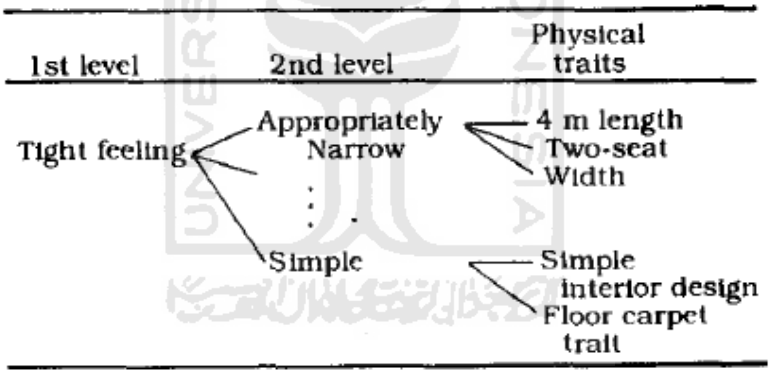


Figure 2.3 Procedure to Transferring Sub-Concept

(Nagamachi, 1995) through the Kansei Engineering Type I procedure, Mazda has succeeded in developing a new sports car, "Miyata", called "Eunos Roadster" in Japan and has become a good seller in the US and in Japan. After this success, Mazda and its subcontractors have used Kansei Engineering Type I as the basic technology for car development.

2. Kansei Word Determination

A Kansei word is a word describing the product domain. Often these words are adjectives, but other grammatical forms are possible. E.g. when describing the domain ‘fork-lift truck’, adjectives like effective, robust, quick, etc. But also, verbs and nouns (acceleration) can occur (SCHÜTTE & EKLUND, 2001). In order to get a complete selection of words, all available sources have to be used, even if the emerging words seem to be similar or the same. Suitable sources can be:

1. Magazines
2. Pertinent Literature
3. Manuals
4. Experts
5. Experienced Users
6. Relating Kansei Studies
7. Ideas, visions

An important point is to translate ideas and visions into Kansei words because also non-existing solutions should be considered, only in this way the Kansei Engineering can be used as a creative product development tool, which generates new and revolutionary solutions. The task is to describe the domain, not the existing products. Depending on the domain considered, the number of existing Kansei word generally varies between 50 and 600 words. Since it is of great importance to collect all existing words, the word collection is continued until no new words occur. The gathered data will critically influence the validity of the results if important words are missing.

(Schütte, R. C. Axelsson, Nagamachi, & Anders Evert Eklund, 2004) Generally, it is considered advantageous to use the original number of words, because a selection would mean a loss of information. On the other hand, if the number of words collected exceeds a critical size it can be difficult to find volunteers to fill in questionnaire forms, due to the amount of time needed. It means that the statistical power may suffer from a low number of participants. Besides that, the quality of the gathered data will also be relatively poor due to effects of fatigue experienced by the participants.

2.2.3 Sematic differential

(OSGOOD, 1952) developed a method of measuring the emotional content of a word more objectively, called 'semantic differential technique', which more than 30 years later became one of the foundations of Kansei Engineering. He was influenced by the different political ideologies, which became evident in World War II and the following Cold War. His assumption was to make a separation between the object and an object-representing sign:

1. The object, 'which is a pattern of stimulation which evokes reactions on the part of an organism', and
2. The sign, 'which is any pattern of stimulation which is not the object but yet evokes reactions relevant to 'object'-conditions under which this holds lying the problem for theory' (OSGOOD, 1952)

This can be shown using a hammer as an example. The spoken word 'hammer' is e.g. not the same stimulus as the object hammer. The former is a pattern of sound waves and the latter a combination of visual, olfactory and tactual sensations. The word hammer elicits a type of behavior, which is in some manners relevant to the object hammer. This means that the spoken or read word 'hammer' is the sign for the object 'hammer'.

Osgood's research resulted, in the simplest terms, into the question 'Under what conditions does something which is not an object become a sign of that object?' (OSGOOD, 1952)

To answer this question, Stagner and Osgood (1946) conducted questionnaire studies. The subjects chosen were supposed to rate signs (words) of objects like Pacifist, Russians, Germans, Dictator or Neutrality (remember that the experiments were conducted under World War II) on bipolar scales. These scales were defined with a number of contrasting adjectives at each end on which the participants checked that position which best represent the direction and intensity according to their point of view.

2.2.4 Affective Product Design

The intention of affective product design is in combining the affective desires of consumers into new product design variables to optimize consumers' affective pleasure (Chan, Kwong, Dillon, & Fung, 2011). The main obstacle for affective design is how to apply consumer affective needs accurately and then to develop products that are in accordance with their wishes. In many cases, it is difficult to grasp the affective desires of consumers because of their linguistic origin. Sometimes, without technical experience, consumers do not know what they really want until their perspective preferences are violated. In real life, consumers, salespeople, and designers use different sets of contexts to express their understanding of information that affects (Zhang, Jiao, & Helander, 2006).

The evolution in product design has led to many developments, producing quality products that are equally good beyond the market. Besides, consumers have extensive product choices and are becoming more sophisticated. Demanded by market demand, companies are pursuing to design products that attract consumers (Lokman, 2010).

Lokman stated that several methods have been proposed to improve customer satisfaction assessment by understanding consumer needs and interests. Namely, there is Quality Function Deployment (QFD), Conference Analysis, Voice of Customer (VoC), Kansei Engineering (KE).

1. The Development of Quality Functions (Akao, 1997) is a sequential approach to design based on a close awareness of consumer needs, coupled with integration of traditional corporate groups. This includes translating consumer desires (for example, reducing writing for pens) into design characteristics (pen ink thickness, pressure at the ball point) for each step of product development.

2. Conjoint Analysis (Green & Srinivasan, 1990) is any decipherment method that predicts consumer perspective structures (for example, estimating preference parameters such as value-parts, important weights, ideal points), given their overall evaluation of a set of predetermined alternatives in terms of level different categories.

3. Voice of Customer (Gaskin, Katz, & Klein, 1990) is a product development method that creates a specific series of consumer needs and desires organized into hierarchical structures, and then prioritized in terms of interests and satisfaction relative to current choices.

4. Kansei Engineering (Nagamachi, 1995) methodology that combines Kansei and Engineering fields to realize products that are in accordance with the wants and needs of consumers. This is done by analyzing Kansei consumers and translating how the product design gets Kansei. It gathers the experience of Kansei consumers and builds mathematical prediction models about how Kansei is relevant to the physical characteristics of the product. The goal of KE is to improve human welfare by considering the physiological and psychological aspects that affect satisfaction.

In particular, the last methodology mentioned, Kansei Engineering is on different interests. Because it is a special tool specifically designed to calculate emotional consumer needs and turn them into products. Kansei Engineering has the furthest possibility in the effort to introduce engineering methods into desired consumer needs.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Subject

The subjects of the research are the online and offline plant sellers that originated from the related trading forum. The online forum is derived from Facebook and other online media.

3.2 Data Collection Method

3.2.1 Type of Data

a. Primary Data

Primary data are the data that directly obtained from the research. The purposes of obtaining primary data is to find several data that might support everything that needed by the research. The primary data that employed in this research mostly obtained by using questionnaire method that divided into several stages.

The stages of questionnaire that appear namely:

1. Problem determination questionnaire

The problem determination questionnaire is the questionnaire that confirms the authenticity of problems, in which the problems are emerged in real life that needs efficient and effective solution.

2. Kansei Word questionnaire

The Kansei word determination is the questionnaire that being shared to the subject of research, to identify the types of products they are preferred in fulfilling the needs. This questionnaire consists of question that reveal the product's criteria that could fulfill customer's preferences, as the basic of product development.

3. Semantic differential 1 questionnaire

This questionnaire is designated to compare the importance level of Kansei word that already collected by using Kansei word questionnaire, to select Kansei word based on the level of importance and statistical test.

4. Specification Selection Questionnaire

This questionnaire is shared to identify what kinds of specification that respondent needs and chooses, as reference to make new product design

5. Product Validation Questionnaire

This questionnaire is distributed to identify whether the new product design is valid or not to fulfil respondent's needs.

b. Secondary Data

Secondary data are obtained from the existing available data. The data can be sourced from articles, journal, books, Internet media like science direct, and other references that support the establishment of a basic theory in this research.

3.2.2 Apparatus

1. IMB SPSS Ver 25

Data processing in this research was carried out using IMB SPSS Version 25 which is considered as a software that is qualified enough to process the data in this research because it has the tools needed to process data in this research.

2. Questionnaire

Questionnaire is used in this research to get opinions from respondents that needed in this research, researcher requires a media to accommodate it. Questionnaires used in this study are physical and digital. The physical questionnaire was distributed directly to respondents who are reachable by researcher, while the digital questionnaire employs a Google form that is shared online through social media Facebook, olx, Instagram, and WhatsApp.

3.2.3 Survey

The survey on this research is performed by visiting plant sellers both plant sellers who own parks in Yogyakarta DIY and Cilacap, Central Java as well as the online plant sellers who sell their plants on social media forums on Facebook, OlX, Instagram, and WhatsApp that located throughout Indonesia.

The survey is conducted to find out actual problems that are experienced by respondents in shipping their plants, in terms of packaging.

3.2.4 Interview

Interviews are conducted by asking the respondents directly to collect information as much as possible on existing problems during the process of sending plants related to packaging and to discover the sufficient information on types of required design to meet their needs.

3.3 Data Processing and Analysis

3.3.1 Sample Size Determination for Sufficiency data Test

(A. AL-Subaihi, 2003) said that there are several approaches to determine sample sizes. This includes using censuses for small populations, mimicking similar study sample sizes, using an Internet sample size calculator, using published tables, and using mathematical formula. The traditional method for determining the required sample size is to use mathematical model directly. These formulas cover most of the probability sampling designs and can be used in research aimed at estimating population averages or proportions. When population size is unlimited or unknown, sample size is estimated using a formula:

$$n' = \frac{Z^2 p(1-p)}{e\text{^}2}$$

Where:

N' = required sample size

p = expected proportion

z = z value (normal table) related to the accuracy category

E = maximum tolerated error

N' is the limit on the number of questionnaires to be recognized sufficient. This study uses a 90% confidence level, maximum error 10% The questionnaire that will be distributed to respondents is 30. The sample can be said as sufficient if n≥n'.

3.3.2 Validity Test

(Cohen, Manion, & Marrison, Research Method in Education, 2007) In qualitative data, validity indicated the honesty, depth, richness and scope of the data achieved, the participants approached, the extent of triangulation and the disinterestedness or objectivity of the researcher. The steps in the validity test are explained below:

1. Determining the hypothesis

H_0 = $r_{count} \geq r_{table}$, the data obtained is valid

H_1 = $r_{count} \leq r_{table}$, the data obtained is not valid

2. Specifying the value of r_{table}

With the significance level of 5% and the degrees of freedom (df) = n-2, or in this research df = 30 – 2 = 28, then the value of r_{table} can be determined based on r table namely: df = 28, r_{table} 0.361.

3. Determining the value of r_{count}

Rcount value can be obtained after processing data using SPSS 25.0. The rcount value can be seen in the SPSS output 25.0 in the Corrected Item - Total Correlation. Whereas for manual calculations can be seen on the attachment page by using the following formula.

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\left[(N\sum X^2 - (\sum X)^2)(N\sum Y^2 - (\sum Y)^2\right]}}$$

Where:

r_{xy} : coefficient correlation between X variable and Y variable

X : item score

Y : total question score

N : number of respondents

ΣX : sum of item score

ΣY : sum of total question score

ΣX^2 : sum of squared item score

ΣY^2 : sum of squared total item score

ΣXY : sum of the X and Y multiplication

4. Compare the value of r_{table} and r_{count}

   1. If r_{count} is positive and $r_{count} \geq r_{table}$, then H_0 is accepted
   2. If r_{count} is positive and $r_{count} < r_{table}$, then H_0 is rejected

If an item is rejected, iteration must be performed until a valid item is found. To get accurate results, valid calculations, and for the purpose of saving time, the validity test is carried out using SPSS 25.0. The validity test procedure using SPSS 25.0 is written as follows:

1. Turn on *Variable View* and define each column
2. Click *Data View* and fill in the data tabulation of questionnaire
3. Click *Analyze* → *Correlate* → *Bivariate*
4. Enter the entire X variable item into *Items*
5. Make sure to select *Pearson* in Correlation Coefficient category, *Two-tailed* in Test of Significant category, and tick the *Flag significant correlation*
6. Click OK

3.3.3 Reliability Test

(Cohen, Manion, & Marrison, Research Method in Education, 2007) Reliability in quantitative research is actually a synonym for dependability, consistency and replicability over time, over instruments and over groups of respondents. It is concerned with precision and accuracy.

In academic publications, the most commonly used reliability coefficient is Cronbach's alpha, which is a general measure of internal uni-dimensional consistency, a multi-item scale. This criterion is defined as:

$$a = \frac{k}{k-1}\left(1 - \frac{\sum {a_b}^2}{\sigma 1^2}\right)$$

Where:

α : alpha reliability coefficient

k : number of questions

$\Sigma\sigma_b^2$: number of variance items

$\sigma 1^2$: total of variance

The total assumption is that the average covariance among indicators must be positive. Therefore, one can easily see that Cronbach's alpha varies between 0 and 1. The problem in assessing Cronbach's alpha is that the correlation between indicators and scale length is very important, affecting alpha. In addition, sample size has a significant effect on the accuracy of alpha estimates. The general threshold for Cronbach's alpha sufficiency value is 0.6.

In this study, item reliability was tested using SPSS version 25 for Windows. Cronbach's alpha value will be considered for all reliability items in one variable. The reliability test procedure using SPSS is written as follows:

1. Turn on *Variable View* and define each column
2. Click *Data View* and fill in the data tabulation of questionnaire
3. Click *Analyze* → *scale* → *Reliability Analysis*
4. Enter the entire X variable item into *Items*
5. Make sure to select *Alpha* in Model category
6. Click OK

3.3.4 Kruskal Wallis Test

Based on (MC Donald, 2014) the most common use of the Kruskal–Wallis test is when there is one nominal variable and one measurement variable, an experiment that usually analyze using one-way anova, but the measurement variable does not meet the normality assumption of a one-way anova. The Kruskal-Wallis test is a non-parametric test, which means that it does not assume that the data come from a distribution that can be completely described by two parameters, mean and standard deviation (the way a normal distribution can). Like most non-parametric tests, it is performed on ranked data, so by converting the measurement observations to their ranks in the overall data set: the smallest value gets a rank of 1, the next smallest gets a rank of 2, and so on. The null hypothesis of the Kruskal–Wallis test is that the mean ranks of the groups are the same.

1. Open SPSS
2. input the data
3. Click Analyze tab menu
4. choose non-Parametric test
5. Choose K-Independent Samples
6. Click ok

The output of Kruskal Wallis that will be used for data calculation will be shown in table3.1

Table 3.1 Kruskal Wallis Output Example

Test Statistics[a,b]

	choices_Strength
Kruskal-Wallis H	14.471
df	19
Asymp. Sig.	.756

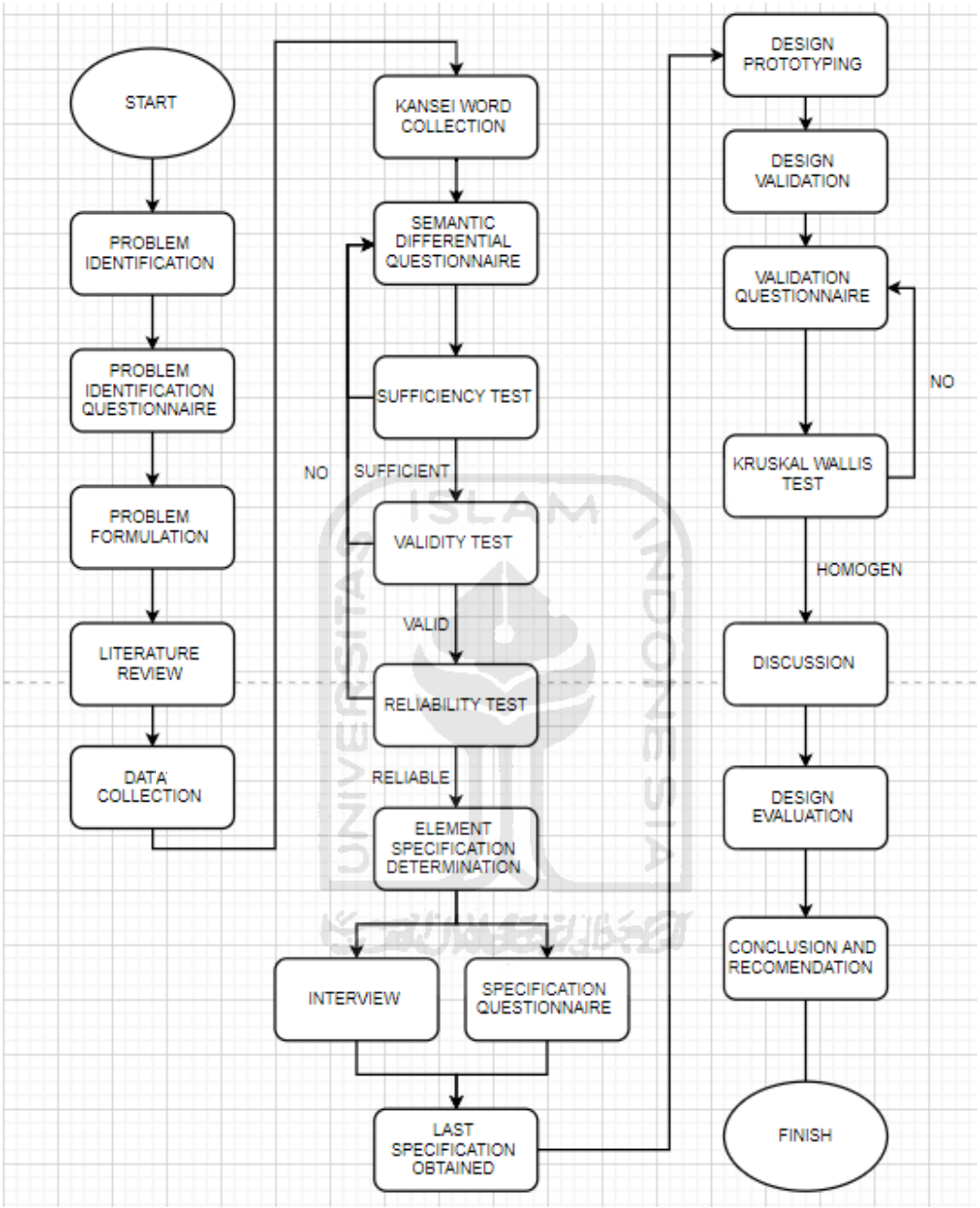
a. Kruskal Wallis Test

b. Grouping Variable: Respondent_Name

3.4 Research Flowchart

The research flowchart in this study serves as a tool for the reader to see how the flow of research is conducted. The research flowchart shows the flow of research from the beginning of the research, namely the determination of the problem to the end of the research, namely the conclusions and recommendations

Figure 3.1 Research Flowchart



CHAPTER IV

DATA COLLECTING AND PROCESSING

4.1 Data Collection

Data collection in this study was conducted by interview, field survey, and questionnaire distribution. Questionnaires were distributed to 20-30 respondents because based on (Cohen, Manion, & Marrison, Research Method in Education, 2007) the larger the sample the better, because this not only provides greater reliability but also allows more sophisticated statistics to be used. But, due to make the research efficient, researcher decides to take 20-30 respondent sand run sufficiency test to make sure the data are enough to be processed using statistical method.

4.2 Data Processing

4.2.1 Respondent Profile Questionnaire.

In this research, the data are obtained by distributing the questionnaire directly or using a Google form, distributing it online, and offline to 20-30 respondents who were considered as competent sources for each questionnaire. Table 4.1 below describes the personal data of the respondents in this research.

Table 4.1 Respondent Profile

No	Name	Region	Gender
1	Sukardi	Yogyakarta	male
2	Kamto	Cilacap	male
3	Supri	Cilacap	male
4	Suprianto kodirin	Cilacap	male
5	Suprianto suwanto	Cilacap	male
6	Sukadi	Cilacap	male
7	Tiyo sobirin	Yogyakarta	male
8	Teguh	Yogyakarta	male
9	Wahyudi tarman	Yogyakarta	male
10	Rudianto	Yogyakarta	male
11	Zaenal	Cilacap	male
12	Hardi	Yogyakarta	male
13	Kodirin	Yogyakarta	male
14	Khoerudin	Cilacap	male
15	Yuli	Cilacap	male
16	Toro (Guteng)	Yogyakarta	male
17	Hendrik	Yogyakarta	male
18	Darman	Yogyakarta	male
19	Adi	Yogyakarta	male
20	Rahmat	Cilacap	male
21	Andi	Yogyakarta	male
22	Rohman	Yogyakarta	male
23	Soeharno	Yogyakarta	male

24	Karto	Yogyakarta	male
25	Damar	Cilacap	male
26	Sukardi	Yogyakarta	male
27	Sujianto (gondrong)	Yogyakarta	male
28	Soleh	Yogyakarta	male
29	Pras	Yogyakarta	male
30	Sarhudin	Yogyakarta	Male
31	Denny Febriansyah	Bandung	Male
32	Ardy	jakarta	Male
33	G Y Riaples	Yogyakarta	Male
34	Aam	yogyakarta	Male
35	Chandra Wibawa	Yogyakarta	Male
36	Turmudzi	Yogyakarta	Male
37	Agus Purnama	Yogyakarta	Male
38	Halima	Bogor	Female
39	Muhammad Iqbal	Yogyakarta	Male
40	Soffa	jakarta	Male
41	Iqbal	Bekasi	Male
42	Adhitya Permadi	Yogyakarta	Male
43	Kodirin	Yogyakarta	Male
44	Plant your Plan	Jakarta	Male
45	Lina Fery Guntari	Jakarta	Female
46	Eko Setyawan	Jakarta	Male
47	Tina Sri	Bekasi	Female
48	Denny Pradana	Jakarta	Male
49	Pramono	Yogyakarta	Male
50	Rini	Yogyakarta	Female
51	Suradi	yogyakarta	Male
52	Rendi	Yogyakarta	Male
53	Imam Thurmudzi s	Yogyakarta	Male
54	Budi s	Yogyakarta	Male
55	Koko	Yogyakarta	Male
56	Adi	Yogyakarta	Male
57	Rahman	Yogyakarta	Male
58	Nur Arifin	Jakarta	Male
59	Ranto	Cilacap	Male

60	Ahmad Faisol	Banyumas	Male

4.2.2 Collecting Kansei Word

Collecting Kansei word is the first stage in the Kansei method that is obtained by sharing a questionnaire to 30 respondents. It contains questions about the criteria of an item that required by the customer to fulfill their needs. Later, 27 Kansei words are obtained. table 4.2 contains 27 Kansei words which are obtained from the Kansei word.

Table 4.2 Kansei Word Approach Table

NO	KANSEI WORD
1	Strong
2	Environmentally Friendly
3	Cheap
4	Attractive shape
5	Practical
6	Durable
7	Unique Shape
8	Easy to carry
9	Can Be Used Many Times
10	Light
11	Comfortable to Hold
12	Waterproof
13	Shock Resistant
14	There is specification information
15	There is Sender information
16	Easy to remember
17	Interesting Motive
18	Can be reversed
19	Easy to Open
20	Pack 1 Product With 1 Pack
21	Pack Lots of Products with 1 Pack

22	Modern
23	Neat
24	Safe
25	Resilient
26	Simple
27	With Plastic Cover

4.2.3 Sufficiency Data Test

After the Kansei word Questionnaire is distributed and 27 Kansei words are obtained, the next step is to conduct a statistical test that begins with sufficiency data test. This observation uses a significance level of 90% (Z value 1,645) and the expected proportion is 1/30 = 0.034. The maximum error obtained is 10%. Equation below shows the calculation of the simple size calculation.

n' = required sample size

n = 30

p = 1/30 = 0.034

z = 90% = 1.645

e = 10% = 0.1

$$n' = \frac{2.706x0.034(1 - 0.034)}{0.01} = 8.635$$

4.2.4 Semantic differential 1 Questionnaire Evaluation

After the sample data has been declared sufficient, the next step is to re-distribute the questionnaire, namely the semantic differential questionnaire, which is one of the stages in processing statistical data. In this study, researcher distribute questionnaires to 30 respondents who are considered experts in the field of buying and selling plants, namely plant seller in Indonesia. Below is the result of semantic differential 1 questionnaire. Table 4.3 shows the result of semantic differential questionnaire 1.

Table 4.3 Semantic Diffrential 1 Result

Name	Strong	Environmentally Friendly	Cheap	Attractive Shape	Practical	Durable	Unique Shape	Easy to Carry	Can Be Used Many Times	Light	Comfortable to Hold	Waterproof	Shock Resistant	There is Specification Information	There is Sender Information	Easy to Remember	Interesting Motive	Can be Reversed	Easy to Open	Pack 1 Product With 1 Pack	Pack Lots of Products with 1 Pack	Modern	Neat	Safe	Resilient	Simple	With Plastic Cover
Sukardi	5	5	5	1	5	5	1	4	5	5	5	5	5	5	1	2	1	5	5	1	5	1	5	5	5	5	5
Kamto	5	5	5	5	5	5	1	5	1	5	5	5	5	1	1	1	1	5	5	5	1	1	5	5	5	5	1
Supri	5	5	5	1	5	5	1	5	1	5	5	5	5	1	5	2	1	5	5	5	1	1	5	5	5	5	1
Suprianto kodirin	5	5	5	5	5	5	5	5	5	5	5	5	5	1	1	1	5	5	5	1	5	5	5	5	5	5	5
Suprianto suwanto	5	4	5	2	5	2	1	2	1	5	4	5	5	4	4	2	1	5	5	1	5	1	5	5	5	5	1
Sukardi	4	1	5	5	4	2	2	4	1	5	2	1	5	1	2	2	1	5	5	1	5	1	5	5	4	5	1
Sujianto (Gondrong)	3	4	4	1	4	1	1	2	2	4	2	5	4	5	5	1	1	5	5	5	1	2	5	4	5	4	5
Soleh	5	5	5	5	4	5	5	4	2	4	5	1	4	1	4	2	2	4	4	5	1	1	4	4	4	4	1
Pras	4	1	4	1	5	4	4	2	5	4	1	1	5	5	5	2	2	5	4	1	5	2	4	5	5	5	1
Sarhudin	4	5	4	5	4	5	1	5	4	4	5	5	4	1	4	1	1	4	4	5	1	2	5	4	4	4	5
Sukadi	5	4	5	1	5	5	2	2	5	5	1	5	5	2	1	2	4	5	5	5	1	1	5	5	4	5	5
Tiyo sobirin	5	5	5	1	5	5	1	5	5	5	5	5	5	5	5	2	2	5	5	5	1	1	5	5	5	5	5
Teguh	5	5	5	1	5	5	1	5	5	5	1	5	5	5	1	3	1	5	5	5	1	1	5	5	5	5	1
Wahyudi tarman	5	4	5	2	5	5	2	3	5	5	5	5	5	1	1	1	1	5	5	1	5	1	5	5	5	5	1
Rudianto	5	3	5	1	5	5	2	5	5	5	1	5	5	5	1	3	1	5	5	1	5	1	5	5	5	5	1
Zaenal	5	5	5	1	5	5	2	5	5	5	1	5	5	5	1	2	1	5	5	1	5	2	5	5	5	5	1
Hardi	5	5	5	1	5	5	1	5	5	5	5	5	5	1	1	2	1	5	5	1	5	5	5	5	5	5	1
Kodirin	5	5	5	5	5	5	1	5	5	5	1	5	5	5	1	1	1	5	5	5	1	5	5	5	5	5	1
Khoerudin	5	5	5	3	5	5	1	5	5	5	5	5	5	1	1	1	1	5	5	1	5	5	5	5	5	5	1
Yuli	5	5	5	1	5	5	1	5	5	5	5	5	5	5	1	1	5	5	5	1	5	5	5	5	5	5	1
Toro (Guteng)	4	5	5	1	5	5	2	5	1	5	5	4	5	1	1	1	3	5	5	1	5	1	5	5	5	5	5
Hendrik	5	4	4	1	5	5	1	5	1	5	5	4	4	5	5	2	1	4	5	1	5	1	5	5	4	4	5
Darman	4	5	4	2	4	1	1	5	5	4	5	4	4	2	1	1	1	5	4	1	5	1	4	4	4	4	5
Adi	4	4	4	1	4	1	2	4	5	5	5	5	4	1	1	3	3	4	4	5	1	1	5	4	4	5	5
Rahmat	4	5	4	4	4	4	4	5	1	4	4	5	5	2	1	3	3	4	4	5	1	2	4	4	5	4	5
Andi	4	5	5	2	4	4	2	5	5	4	5	5	4	2	1	2	1	4	4	1	5	1	5	4	5	4	5
Rohman	4	4	4	1	4	4	2	5	5	4	5	5	5	2	4	2	3	4	5	5	1	2	5	4	5	5	4
Soeharno	5	5	5	4	5	5	4	5	5	4	4	4	4	1	1	3	2	5	4	1	5	2	4	5	5	5	5
Karto	4	4	4	1	4	1	1	5	5	4	3	5	4	2	4	1	3	4	4	1	5	1	5	4	5	4	4
Damar	5	4	5	5	5	5	5	5	1	4	3	4	4	1	1	1	4	5	5	1	5	2	4	4	4	5	5

4.2.5 Validity Test

After the results of the semantic differential questionnaire are obtained, the next step is to conduct a validity test. Kansei word is declared valid if the results of calculations using IMB SPSS Version 25.0 state that r-Calculation ≥ r-Table (0.361)

1. 1st Validity test Iteration

The results of data processing for the first iteration performed on 27 Kansei word. The result of first iteration can be seen on table 4.4.

Table 4.4 Validity Test 1st Iteration Table

NO	KANSEI WORD	Pearson correlation	r-table	Description
1	Strong	0.594	0.361	Valid
2	Environmentally friendly	0.563	0.361	Valid
3	Cheap	0.414	0.361	Valid
4	Attractive shape	0.067	0.361	Invalid
5	Practical	0.564	0.361	Valid
6	Durable	0.685	0.361	Valid
7	Unique Shape	0.108	0.361	Invalid
8	Easy to carry	0.436	0.361	Valid
9	Can Be Used Many Times	0.345	0.361	Invalid
10	Light	0.332	0.361	Invalid
11	Comfortable to Hold	0.261	0.361	Invalid
12	Waterproof	0.469	0.361	Valid
13	Shock Resistant	0.336	0.361	Invalid
14	There is specification information	0.129	0.361	Invalid
15	There is Sender information	-0.246	0.361	Invalid
16	Easy to remember	-0.058	0.361	Invalid
17	Interesting Motive	0.379	0.361	Valid

18	Can be reversed	0.204	0.361	Invalid
19	Easy to Open	0.353	0.361	Invalid
20	Pack 1 Product With 1 Pack	-0.015	0.361	Invalid
21	Pack Lots of Products with 1 Pack	0.015	0.361	Invalid
22	Modern	0.557	0.361	Valid
23	Neat	0.184	0.361	Invalid
24	Safe	0.386	0.361	Valid
25	Resilient	0.384	0.361	Valid
26	Simple	0.384	0.361	Valid
27	With Plastic Cover	0.121	0.361	Invalid

7. 2nd Validity test Iteration

The results of data processing for the second iteration carried out on 12 Kansei word. The result of second iteration can be seen on table 4.5.

Table 4.5 Validity Test 2nd Iteration Table

NO	KANSEI WORD	Pearson correlation	r-table	Description
1	Strong	0.687	0.361	Valid
2	Environmentally friendly	0.592	0.361	Valid
3	Cheap	0.586	0.361	Valid
4	Practical	0.676	0.361	Valid
5	Durable	0.73	0.361	Valid
6	Easy to carry	0.489	0.361	Valid
7	Waterproof	0.53	0.361	Valid
8	Interesting Motive	0.305	0.361	Invalid
9	Modern	0.615	0.361	Valid
10	Safe	0.498	0.361	Valid
11	Resilient	0.443	0.361	Valid
12	Simple	0.506	0.361	Valid

8. 3rd Validity Test Iteration

The results of data processing for the third iteration carried out on 12 Kansei word. The result of third iteration can be seen on table 4.6.

Table 4.6 Validity Test 3rd Iteration Table

NO	KANSEI WORD	Pearson correlation	r-table	Description
1	Strong	0.687	0.361	Valid
2	Environmentally friendly	0.592	0.361	Valid
3	Cheap	0.586	0.361	Valid
4	Practical	0.676	0.361	Valid
5	Durable	0.73	0.361	Valid
6	Easy to carry	0.489	0.361	Valid
7	Waterproof	0.53	0.361	Valid
8	Modern	0.615	0.361	Valid
9	Safe	0.498	0.361	Valid
10	Resilient	0.443	0.361	Valid
11	Simple	0.506	0.361	Valid

4.2.6 Reliability Test

The next step is the reliability test. After the results of the validity test are obtained; the next step is to perform the reliability test on the remaining 11 Kansei word. The Kansei word is declared as reliable if the results of calculations using the IMB SPSS Version 25.0 state 60% or 0.6 ≤Cronbach' Alpha. The test is performed by using an error tolerance of 5% or 0.05, a df value of df = 30-2 = 28 and a r table value of 0.361. The results of the reliability test can be seen in the Table 4.7.

Table 4.7 Reliability Cronbach's Alpha Table

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.762	.836	11

4.2.7 Item and product specification Determination

The next stage in this research is to determine the specifications of the packaging design for plants based on the remaining Kansei words that have been eliminated and validated as Valid and Reliable based on the results of statistical calculations using spss ver 25.0. The Kansei word then broken down into several levels, namely level 0, level 1, level 2, level 3, level 4, and level 5. The earliest level 0 element here is the Kansei word itself, then level 1 and the rest present more specific descriptions about the previous level up to level 5, in which the specifications will be revealed and employed as the basis for designing the final plant packaging.

Determination of level 1, level 2, level 3, level 4, and level 5 in this study was carried out by conducting discussions and consultations with respondents who are considered as competent people in buying and selling plants. Table 4.8 shows the option of specification that emerged as results of the discussion on the determination of leve1, level 2, level3, level4, and level5;

Table 4.8 Item and Product Specification Determination

No	**level 0**	**level 1**	**level 2**	**level 3**	**physical design approach**
1	Strong	packaging strength	strong material	Material selection	wood bamboo Rotan cardboard plastic Styrofoam
				Way to Assemble	nail puzzle lock rubber rope wooden rope bamboo rope glue
2	Environmentally friendly	packaging impact to environment after usage	easy soil decomposes material	Material selection	wood bamboo Rotan cardboard plastic Styrofoam
3	Cheap	packaging price	cheap price material	material selection	wood bamboo Rotan cardboard plastic Styrofoam
				vendor selection	cheapest vendor selection Abandoned Secondhand material
4	Practical	easy to use	easy to use packaging design		folding design

				design the easiest to pack packaging	puzzle design
5	Durable	packaging usage time	long-life material	material selection	wood bamboo Rotan cardboard plastic Styrofoam
6	Easy to carry	easy to bring	easy to carry packaging design	add extra grip	add internal handgrip add external handgrip add elastic handle by rope
7	Water Resistance	packaging resistance to water or not easy to break material when get wet	water resistance material	add water resistance extra material	plastic waterproof paint rubber paint bamboo
				material selection	Styrofoam plastic
8	Modern	packaging modern view	modern view design	add modern impression	put the modern color make borderless design
9	Safe	packaging safety	safe packaging design	design the safety packaging	make bold material design add extra protection material
10	Resilient	packaging shape consistency to damage		material selection	wood bamboo

			taught material selection, taught design orientation	add extra packaging protection	Rotan cardboard plastic Styrofoam make borderless design, bubble wrap spoons rubber Styrofoam make the solid view make 2 tone view
11	Simple	packaging simple view	simple view packaging design	reduce the unneeded view	

4.2.8 Last Design Specification Determination

The last design specification is done by distributing questionnaires to respondents. The contents of the questionnaire distributed are the choices of specifications that has previously appeared as a reflection of leveling in the previous stage. Option of specifications are given to respondents so that researcher can find out what packaging design specifications were chosen by the respondents so that the needs of the respondents' needs can be met by involving these specifications in plant packaging designs. Table 4.9 are the results of the specification selection questionnaire.

Table 4.9 Specification Percentage Table

Strong Kansei word	Percentage	environmentally friendly word	Percentage	cheap word	Percentage
bamboo material based	90%	wood material based	5%	bamboo material based	85%
Rotan material based	10%	bamboo material based	85%	paperboard material based	5%
assembled using nail	50%	Rotan material based	10%	Styrofoam material based	10%
assembled using bamboo rope	50%	paperboard material based	10%	Cheapest vendor selection	40%
				abandoned secondhand material	35%
Practical	**Percentage**	**Durable Word**	**Percentage**	**Easy to Carry Word**	**Percentage**
folding design	20%	Bamboo Material based	90%	add internal handgrip	10%
puzzle design	80%	Rotan material based	10%	add external handgrip	5%
				add elastic handle by rope	85%

Water Resistance Word	**Percentage**	**Modern Word**	**Percentage**	**Safe Word**	**Percentage**
add extra plastic material	55%	add modern color	100%	Borderless design	50%
Bamboo material based	60%	solid elegant	5%	Bold material design	45%
		simple	5%	add extra protection material	10%

Resilient Word	**Percentage**	**Simple Word**	**Percentage**
bamboo material based	90%	make solid view	95%
rotan material based	10%	make 2 tone view	5%
borderless design	65%		
add bubble wrap	25%		
add sponge	5%		

Specifications with the highest percentage value are specifications that will be taken for the final design of plant packaging. Based on the table, the specifications selected for final plant packaging design are listed in the Table 4.10

Table 4.10 Final Design Specification

Last Design specification
bamboo material based
assembled using bamboo rope
Cheapest vendor selection
puzzle design
add elastic handle by rope
add modern color
Borderless design
make solid view

4.2.9 Design of Plant Packaging Based on Specification Determination

After getting the specifications, the next step is to translate the specifications into prototype design. The prototype was made using the Autodesk 2019 Inventor application. Figure 4.1, 4.2, 4.3, and 4.4 illustrate the design of the plant packaging for this research.

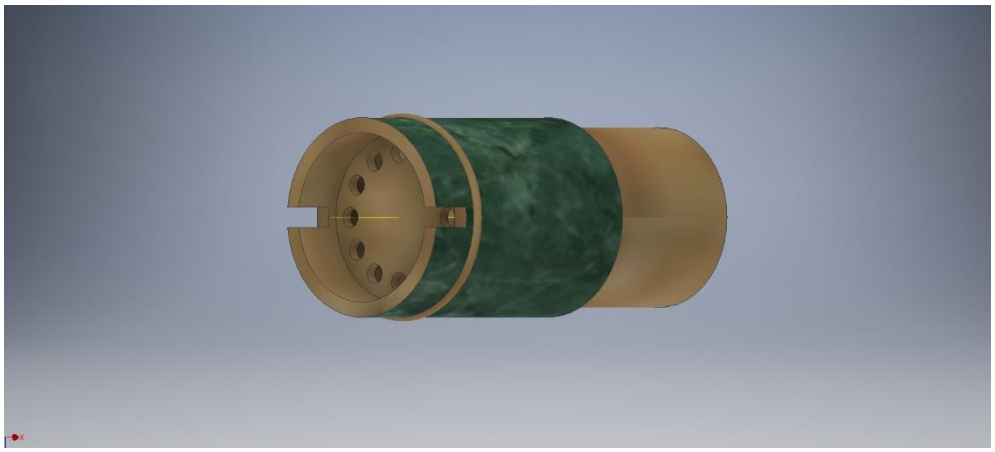


Figure 4.1 Bottom View of Packaging Design

Figure 4.2 Top View of Packaging Design

Figure 4.3 Whole View of Packaging Design

Figure 4.4 Vase View of Packaging Design

4.2.10 Validity Test for final design

After determining the final design, the next step is to test the design. The purpose of this test is to find out whether plant packaging design made by researcher can be a media to meet the needs of respondents or not. The test is carried out by distributing questionnaires containing the design of the plant packaging in the form of 3D prototype drawings and running Kruskal Wallis test. Table 4.11 is the result of Kruskal Wallis test.

Table 4.11 Kruskal Wallis Result

Test Statistics[a,b]

	choices_Strength
Kruskal-Wallis H	14.471
Df	19
Asymp. Sig.	.756

a. Kruskal Wallis Test

b. Grouping Variable: Respondent_Name

CHAPTER V

DISCUSSION

5.1 Kansei Word Determination as the unfulfilled customers' needs.

Kansei word is a collection of words that taken from the needs of the plant seller respondents that must be met, so that the existing problems in every activity related to the sale and purchase of plants will be overcome. Questionnaires in this study were distributed to 30 respondents who were considered as people who understand well about the activities of buying and selling plants, in terms of packaging plants.

In the Kansei word determination questionnaire, the researcher provides several choices that were previously taken from short observations, namely Strong, Environmentally Friendly, Cheap, Attractive Shape, Practical, Durable, Unique Shape, Easy To Carry, Can Be Used Multiple Times, Light, Comfortable To Hold, Waterproof, Shock Resistant, There Is Specification Information, There Is Sender Information, Easy To Remember, Interesting Motive, Can Be Reversed, Easy To Open, Pack 1 Product With 1 Pack, Pack Lots Of Products With 1 Pack, And Modern.

The purpose of giving Kansei word choices from the researcher is to facilitate the process of selecting Kansei words by the respondents because if researcher do not provide options in the questionnaire, the confusion might appear.

In addition to provide several Kansei word options, researcher also provide “other” selection columns that act as the additional column to accommodate respondents with other choices that unlisted by the researcher.

After the questionnaire was distributed to 30 respondents, there are 21 Kansei words that are selected from the words provided by researcher. While there are other 6 Kansei words are independently chosen by respondent by filling out the provided alternative column. Hence, the total Kansei words are 27, namely, Strong, Environmentally Friendly, Cheap, Attractive Shape, Practical, Durable, Unique Shape, Easy To Carry, Can Be Used Many Times, Light, Comfortable To Hold, Waterproof, Shock Resistant, There Is Specification Information, There Is Sender Information, Easy To Remember, Interesting Motive, Can Be Reversed, Easy To Open, Pack 1 Product With 1 Pack, Pack Lots Of Products With 1 Pack, Modern, Neat, Safe, Resilient, Simple, With Plastic Cover.

The 27 Kansei words that have been obtained from direct distribution of questionnaires and online via google form through social media represent the unfulfilled needs of the respondents related to the buying and selling process. It is expected to be fulfilled in order to reduce all possibilities which can cause losses or have caused losses in the process of buying and selling plants.

5.2 Kansei Word elimination

5.2.1 Sufficiency Data test

Sufficiency test on this research is carried out using the formula of sample size determination for survey research. The formula is presented as follows.

$$n' = \frac{Z^2 p(1-p)}{e\text{^}2}$$

The use of the formula above is based on (A. AL-Subaihi, 2003) that said, when population size is unlimited or unknown then the formula that used to calculate sample size determination is the formula above.

This observation uses a significance level of 90% (Z value 1,645) since the questionnaire result is in the form of feeling opinion and the researcher is unsure that all of the questions can be well identified by the respondent. The expected proportion is 1/30 = 0.034. The maximum error obtained is 10%. The result of the calculation is:

$$n' = \frac{2.706x0.034(1-0.034)}{0.01} = 8.635$$

The n' is the sample size requirement for this research is determined as 8.635 or rounded up to 9 so the number of respondents that should be involved in this research at least 9 or more that 9 to make the data sufficient.

5.2.2 Semantic differential 1 questionnaire

Semantic differential 1 is done as a first step in statistical testing in this research. Semantic differential 1 is carried out to determine the importance of a selected Kansei word for further elimination using the next stage of the statistical method.
The importance level of Kansei word in this study is divided into 5 levels starting from 1-5. Scale 1-5 referred to the following meanings:

1. 1 means that the element is not very important to be included in a plant packaging design
2. 2 means that the element is not important to be included in a plant packaging design
3. 3 means that the element is neutral in a plant packaging design
4. 4 means that the element is important to be included in a plant packaging design
5. 5 means that the element is very important to be existed in a plant packaging design

5.2.3 Validity Test

Validity test in this research was carried out using IMB SPSS ver 25.0. Tests are carried out by using error tolerance of 5% or 0.05, df value df = 30-2 = 28 and r table value 0.361. The Kansei word is declared valid if r-Calculation ≥ r-Table (0.361). Validity tests will be continued and repeated until all of the Kansei words are valid. Below are the data validation efforts conducted in this study.

1. Validity Test 1st iteration

In the 1st iteration validity test, it is found that Strong has r-calculation 0.594, Environmentally Friendly has r- calculation 0.563, Cheap has r-calculation 0.414, Practical has r-calculation 0.564, Durable has r-calculation 0.685, Easy to Carry has r-calculation 0.436, Waterproof has r-calculation 0.469,

Interesting Motive has r-calculation 0.379, Modern has r-calculation 0.557, Safe Not Damaged has r-calculation 0.386, Resilient has r-calculation 0.384, and Simple Elements has r-calculation 0.384. All of those Kansei words has r-Calculation ≥ r-Table (0.361). Therefore, Kansei word can be concluded as valid while Attractive shapes has r-calculation 0.067, Unique Shape has r-calculation 0.108, Can Be Used Many Times has r-calculation 0.345, Light has r-calculation 0.332, Comfortable to Hold has r-calculation 0.261, Shock Resistant has r-calculation 0.336, There is specification information has r-calculation 0.129, While, Sender information has r-calculation -0.246, Easy to remember having r-calculation 0.058, Can be Reversed has r-calculation 0.204, Easy to Open has r-calculation 0.353, Pack 1 Product With 1 Pack has r-calculation 0.015, Pack Lots of Products with 1 Pack has r-calculation 0.015, Neat has r-calculation 0.184, and With Plastic Cover has r-calculation 0.121. All of those Kansei words have r-Calculation ≤ r-Table (0.361). Therefore, Kansei word can be concluded as invalid and should be eliminated.

2. Validity Test 2nd iteration

In the 2nd iteration of validity test, it is found that Strong has r-calculation 0.697, environmentally friendly has r-calculation 0.592, Cheap has r-calculation 0.586, Practical has r-calculation 0.676, Durable has r-calculation 0.73, Easy to carry has r-calculation 0.498, Waterproof has r-calculation 0.53, Modern has r-calculation 0.615, Safe has r-calculation 0.498, Resilient has r-calculation 0.443, and Simple has r-calculation 0.506. All of those Kansei word has r-Calculation ≥ r- Table (0.361). Therefore, Kansei word can be concluded as valid while Interesting motives has r-calculation 0.305. The Kansei word has r-Calculation ≤ r-Table (0.361) therefore Kansei word can be concluded as invalid and should be eliminated.

3. Validity Test 3rd Iteration

In the validation 3rd iteration, it is found that Strong has r-calculation 0.687, Environmentally friendly has r-calculation 0.592, Cheap has r-calculation 0.586, Practical has r-calculation 0.676, Durable has r-calculation 0.73, easy to carry has r-calculation 0.489 Waterproof has r-calculation 0.53, Modern has r-calculation 0.615, Safe has r-calculation 0.498, Resilient has r-calculation 0.443, and Simple has r-calculation 0.506. All of those Kansei words has r-Calculation ≥ r- Table (0.361). Therefore, it can be concluded that all of the remaining elements are valid and the validation test is complete.

5.2.4 Reliability Test

Reliability tests is performed using the SPSS application ver 25.0. The Kansei word is declared as reliable if the results of calculations using the IMB SPSS Version 25.0 state that Cronbach 'Alpha is more than 60% or 0.6. Testing is done by using an error tolerance of 5% or 0.05, a df value of df = 30-2 = 28 and a r table value of 0.361. From the results of the calculation of SPSS, the Alpha Cronbach value is 0.762. value 0.762 ≥ 0.60 so the data can be concluded as reliable.

5.3 Respondent Specification Choices

This stage is the stage of respondent choosing specifications. The specifications must be relevant to the selected Kansei word because the selected Kansei word is a collection of words that become criteria that must be met so that the needs of the respondents can be fulfilled. Kansei Engineering is a method that prioritizes human feeling to fulfill human needs. Therefore, each step in this study prioritizes the opinions of respondents. One of the step in performing it by asking respondents about their preferred specifications according to their feelings, so that their unmet needs can be fulfilled.

The tool that is used to get the data requirement for specifications is a questionnaire. Questionnaires were distributed to 20 people and the following are the results of the questionnaire and its explanation.

5.3.1 Strong Kansei Word

In Strong Kansei word, several choices of specifications are given, including made from wood, made from bamboo, made from rattan, made from cardboard, made from plastic, made from Styrofoam, assembled using nails, assembled using bamboo ropes, assembled using wood rope, assembled using glue. But the specifications chosen by the respondents are, made from bamboo with 90% turnout, made from rattan with 10% turnout, assembled using nails with 50% turnout, assembled using bamboo ropes with 50% turnout. Specifications with the highest voters are the specifications that will be selected as specifications for plant packaging design. Because made from bamboo which represents the main component and assembled using bamboo ropes which represent the assembly method has the highest percentage, the specification will be selected as the selected specification. The specifications of assembled using bamboo ropes and assembled using nail have the same number of voters but the selected ones are assembled using bamboo ropes because assembled using nails according to some respondents will be worried about causing the material to break easily seeing the specifications that represent the main material are bamboo.

5.3.2 Environmentally friendly Kansei Word

In the environmentally friendly Kansei word, several specifications are given, including made from wood, made from bamboo, made from rattan, made from cardboard, made from plastic, and made from Styrofoam. But the specifications chosen by the respondents are made from wood with 5% turnout, made from bamboo with 85% turnout, made from rattan with 10% turnout, and made from cardboard with 10% turnout.

specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because made from bamboo which represents the main component has the highest percentage, these specifications will be selected as the selected specifications.

5.3.3 Cheap Kansei Word

In cheap Kansei word, several choices of specifications are given, including made from wood, made from bamboo, made from rattan, made from cardboard, made from plastic, made from Styrofoam, bought from the cheapest vendor, and taken from secondhand materials used up. But the Kansei words chosen by the respondents were made from bamboo with 85% turnout, made from cardboard with 5% turnout, made from Styrofoam with 10% turnout, bought from the cheapest vendor with 40% turnout, and taken from secondhand materials used up with 35% turnup. specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because it is made from bamboo which represents the main component and bought from the cheapest vendor which represents the source of material has the highest percentage, the specification will be selected as the selected specification.

5.3.4 Practical Kansei Word

In practical Kansei word, several choices of specifications are given, including folding design with 20% turnout and puzzle design with 80% turnout. Specifications with the highest voters are the specifications that will be selected as specifications for plant packaging designs. Because puzzle design has the highest percentage, these specifications will be selected as the selected specifications.

5.3.5 Durable Kansei Word

In durable Kansei word, several choices of specifications are given, including made from wood, made from bamboo, made from rattan, made from cardboard, made from plastic, and made from Styrofoam but the specifications chosen by the respondents are made from bamboo with the turnout 90% and made from rattan with the turnout 10%. Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because made from bamboo which represents the main component has the highest percentage, these specifications will be selected as the selected specifications.

5.3.6 Easy to carry Kansei Word

In easy to carry Kansei word several choices of specifications are given, including, add internal hand grip with 10% turnout, add external hand grip with 5% turnout, and add elastic handle by rope with 85% turnout. Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because add elastic handle by rope has the highest percentage, the specification will be selected as the selected specification.

5.3.7 Water Resistance Kansei Word

In water resistance Kansei word, several choices of specifications are given, including add plastic wrap additions, add water repellent rubber paint, add waterproof paint, make designs with bamboo material, make designs with Styrofoam materials, make designs with Plastic material but specifications selected by the respondents were additions plastic wrap with 55% turnout and make design with bamboo material with 60% turnout. Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design.

Because made from bamboo which represents the main ingredient has the highest percentage, these specifications will be selected as the selected specifications.

5.3.8 Modern Kansei Word

In modern Kansei word, a choice of specifications is given, namely add modern color with 100% turnout. Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because add modern color has 100% voter percentage, the specification will be selected as the selected specification.

5.3.9 Safe Kansei Word

In safe Kansei word, several specification choices are given, including make a borderless design with 50% turnout, make thick material with 45% turnout, and add extra material protection with 10% turnout. Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because make borderless design has the highest percentage, these specifications will be selected as the selected specifications.

5.3.10 Resilient Kansei Word

In Resilient Kansei word, several specifications are given, including made from wood, made from bamboo, made from rattan, made from cardboard, made from plastic, made from Styrofoam, made a borderless design, add sponge, add bubble wrap, add rubber wrap, and add Styrofoam. But the specifications chosen by the respondents are made from bamboo with 90% turnout, made from rattan with 10% turnout, make a borderless design with 65% turnout, add bubble wrap with 25% turnout, and add sponge with turnout 5%.

Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because it is made from bamboo which represents the main ingredient and make borderless design that represents the form of design has the highest percentage, these specifications will be selected specifications.

5.3.11 Simple Kansei Word

In simple Kansei word, a choice of specifications is given, namely make solid view with 95% turnout and make 2 tone view with 5% turnout. Specifications with the highest voters are the specifications that will be selected as the specifications for plant packaging design. Because make solid view has a 95% voter percentage, the specification will be selected as the selected specification.

5.4 Design Prototype Approach

In Strong Kansei word, Environmentally Friendly, Cheap, Durable, Water Resistance, and Resilient Elements, the choice of specification that has the highest number from voters is bamboo material based.

(Jit Kau, K.Pant, Satya, & Naik, 2016) stated that bamboo is one of the strongest building materials. The tensile strength of bamboo (28,000 pounds per square inch), is much higher than steel (23,000 pounds per square inch). Bamboo plant is found to be an effective carbon sink and effective in mitigation of greenhouse effect.

So, based on those two considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured by using the main material in the form of bamboo. Figure 5.1 is a prototype image of a plant packaging design using bamboo as the main component.

Figure 5.1 Bamboo Based Material Design

In Strong Kansei word, the specification with the most the choices specification that has the highest number from voters is assembled using bamboo ropes.

(Jit Kau, K.Pant, Satya, & Naik, 2016) calculated that bending stress at failure is 0.14 times mass per unit volume. High value of mass per unit volume for bamboo provides greater strength of bending failure.

So, based on those two considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured by using bamboo ropes as a tool for assembly. Figure 5.2 is a prototype drawing of a plant packaging design using bamboo ropes as assembly tools.

Figure 5.2 Bamboo Ropes as Assemble Tools Design

In Kansei word cheap there is also a specification with the highest number of voters and the chosen specifications are the cheapest vendor selection. Based on information from respondents, the choice of specification was chosen because bamboo bought recently from the cheapest vendor will have maximum performance, whereas if bamboo is taken from unused used goods the performance of bamboo will decrease. So, the plant packaging design that is made as the fulfillment of the needs of the respondents that haven't manufactured by using bamboo as the main material that is obtained from cheapest vendor selection. Figure 5.3 is a prototype image of a plant packaging design using bamboo as the main material.

Figure 5.3 Bamboo Based Material 2 Design

During the process of selecting plant packaging design specifications, some respondents also said that bamboo materials were too expensive if only used for a package. But bamboo material was chosen because bamboo is a material that has sufficient specifications that encompasses some Kansei words, which Are Strong, Environmentally Friendly, Cheap, Durable, Water Resistance, And Resilient.

Based on that case, the researcher took the initiative to add more values to the design of the plant packaging design by adding features in the form of additional functions to the plant packaging design, in which the design of plant packaging can be also used as a planting tools or plant vase.

The additional functions make the plant packaging design is cheaper because buyers do not need to buy more plant vases or planting media. When it is compared with packaging with conventional packaging and buying more plant vases, this plant packaging design has more value, which is more practical since it is not only can be used as a plant packaging but also can be a planting tools or plant vase. So that this design is considered as cheaper and practical. Figure 5.4 is a prototype image of a plant packaging design that gets more value by adding a function into a planting medium or flower vase.

Figure 5.4 Vase Form Design

In practical Kansei word, the specification with the most voters and the chosen specification is puzzle design.

(Jit Kau, K.Pant, Satya, & Naik, 2016) stated that bamboo utilization as alternative wood materials may be divided up into following broad categories. The simple processing requires no special skill and equipment.

So, based on those two considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured by assembling like a puzzle. Figure 5.5 is a prototype drawing of a plant packaging designed by assembling a puzzle.

Figure 5.5 Puzzle Design

In easy to carry Kansei word, the specification with the most voters and the chosen specification is the add elastic handle by rope. So, based on that considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured by adding elastic handle by rope. Figure 5.6 is a prototype image of a plant packaging design designed with an add elastic handle by rope.

Figure 5.6 Elastic Handle by Ropes Application Design

In modern Kansei word, the specifications with the most voters and the selected specifications are adding modern colors.

Based on (Dictionary, 2019) modern means, existing in the present or a recent time, or using or based on recently developed ideas, methods, or styles and (Ichiro, et al., 2017) said that The color terms ao (blue) and midori (green) existed side by side in this early period, and their uses were not well distinguished. For example, in the Manyō-Shū poems, the color term awo (precursor to the modern ao) was sometimes used to name the colors of things that were clearly gray (a dappled gray horse), things that could be either green or blue (seaweed; mountains seen in the distance), or things that were clearly green (leaves and grass).

So, based on those two considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured by add modern color. So, the researcher decides to give the color of the design with green. Since the original color of new bamboo is green, the packaging design doesn't need to be repainted anymore. Figure 5.7 is a prototype image of a plant packaging design that is designed with add modern color.

Figure 5.7 Green Color Design

In safe and resilient Kansei word, the specification with the most voters and the chosen specification is making borderless design.

(Kumari, 2015) stated that the strength of the cylinder is equal to 0.8 times the strength of the cubes. So, based on those two considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured with borderless design. Because the original form of bamboo is borderless, this thing also supports the use of bamboo as the main component. Figure 5.8 is a prototype image of a plant packaging design designed with make borderless design.

Figure 5.8 Borderless Design

In simple Kansei word, the specification with the most voters and the chosen specification is making solid view. So, based on that considerations, the researcher decides the plant packaging design that is made as the fulfillment of the needs of the respondents is manufactured with make solid view. Figure 5.9 is a prototype image of a plant packaging design that is manufactured with a solid view.

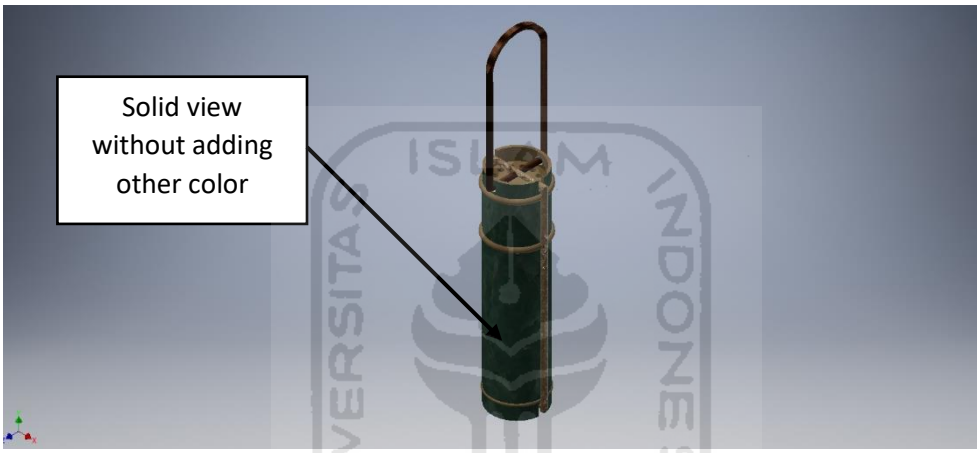


Figure 5.9 Solid View Design

5.5 Design Validity

Based on (Cambridge, 2019) validation is an activity to make something officially acceptable or approved, especially after examining it. So, the design must go through a validation process to prove that the design is in accordance with the existing Kansei word and could become a solution for meeting respondent needs that have unfulfilled in the process of buying and selling plants related to packaging.

The validation process is carried out by designing a validation questionnaire which refers to a statement of how appropriate the design of the packaging design was made by the researcher with the selected Kansei word. The questionnaire was divided into 11 questions representing 11 selected Kansei words. Each question in the questionnaire is a question about

how high the level of agreement of the respondents to the design of the plant packaging design with the word word.

Each question is filled in on a 7-point Likert scale that is, strongly agree, very agree, agree, neutral, disagree, very disagree, strongly disagree. The use of 7 points in the Likert scale is suggested by (Weksi, 2013) that suggested Likert scale is 7 response points because it is preferred by respondents and has good validity, reliability, discrimination, and stability criteria. Questionnaire distributed to 20 respondents selling plants. The results of the questionnaire to state the validity of the design are discussed using the Kruskal-Wallis test assisted with SPSS software ver 25.0. Design validation test is done by Kruskal-Wallis test because the data from the questionnaire recapitulation is included in the comparative data which is purposed to compare responses between samples (respondent), then the data is originated from data with a total of 20 people. After the normality of the test data shows abnormal data, and occasionally one nominal variable and one measurement variable, an experiment usually analyzed using one-way anova, but if the measurement variable does not meet the normality assumption of a one-way anova then the test is done with in the non-arametric test, which is the Kruskal Wallis test.

The validation results are in the form of a Likert scale from the respondents contained in the design validation questionnaire. The test results show that the value of asymmetric Kruskal-Wallis is 0.756 and the level of confidence 95% (probability error 0.05) Proven asymmetric value of Kruskal-Wallis calculated as 0.756. This value is greater than 0.05, so it is stated that H0 is accepted. So it is concluded that there is no significant difference regarding the answers of the respondents in each question in the validation questionnaire, which means that the answers from the respondent are homogeneous or the same if they state that the designs made are appropriate with the selected Kansei word and the design is declared valid according to the Kansei word and become a solution to fulfill the needs of the plant seller respondents in the process of buying and selling plants.

CHAPTER VI

CONCLUSION AND RECOMMENDATION

6.1 Conclusion

After going through several stages of research and the research data processing process, this research analysis resulted in several conclusions. The conclusions of this study are divided into several parts, namely:

1. due to fulfill the unmet needs of plants seller, the proper attribute should be available at the new packaging design. The attributes that should be available at packaging design as the reflection of human feeling in form of Kansei word are; Strong, Environmentally Friendly, Cheap, Practical, Durable, Easy To Carry, Waterproof, Modern, Safe, Resilient, And Simple.

2. To fulfil the unmet need of plant seller, the new packaging design not only should have attribute. The new packaging also needs to have the design parameter and suitable specification. The parameter that should be available on the new packaging design are: strong material, easy soil decomposes material, cheap price material, easy to use packaging design, long-life material, easy to carry packaging design, modern view design, safe packaging design, taught material selection, taught design orientation, simple view packaging design.

After having the parameter, the discussion and analysis between researcher and respondent will be held to discuss what are the suitable specification for each design parameter. The result of the discussion and the analysis generate some suitable specifications. The suitable specification are; bamboo material based, assembled using bamboo rope, cheapest vendor selection, puzzle design, add elastic handle by rope, add modern color, borderless design, make solid view.

3. To identify how valid the new design of plant packaging, the new design of packaging should be tested and the test results show that the value of asymmetric Kruskal-Wallis is 0.756 and the level of confidence 95% (probability error 0.05), proven asymmetric value of Kruskal-Wallis is calculated as 0.756. This value is greater than 0.05, so it is stated that H0 is accepted. So it is concluded that there is no significant difference regarding the answers of the respondents in each question in the validation questionnaire, which means that the answers from the respondent are homogeneous or the same if they state that the designs made are appropriate with the selected Kansei word and the design is declared valid according to the Kansei word and could become a solution to fulfill the needs of the plant seller respondents in the process of buying and selling plants.

6.2 Recommendation

1. This study only concentrates on the initial idea of a solution to problems that occur in plant delivery systems related to packaging so that there are still many limitations in its design such as limitations in terms of types of plants that can be sent using packaging, this is only the type of plant with size small to medium with typical stalks and leaves that are not too swollen, then it is hoped that for future research the design of packaging can be further developed with more design option on it so that it can be used for all types of plants, not limited to certain types of plants and certain sizes.

2. Furthermore, the researcher hopes for further research to be able to design and analyze specifically about the calculation of the cost that must be spent in designing this packaging and run usability test on it.

3. The next hope is that further research can realize a real prototype design of packaging and then can be properly applied to be market so that it really becomes a solution to the problems experienced by plant sellers and opens new business avenues for some groups who see business potential inside it.

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ATTACHMENT 1
Problem Formulation and Kansei Word Determination Questionnaire

KUESIONER PENGANGKATAN MASALAH YANG TERJADI PADA PROSES PENGIRIMAN BISNIS JUAL BELI TANAMAN

Assalamualaikum Warahmatullahi Wabarakatuh.
Perkenalkan nama saya Nurman Gesit Rianto Mahasiswa Teknik Industri Universitas Islam Indonesia angkatan 2014. Pada saat ini saya sedang melaksanakan Tugas Akhir untuk "Men design kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman pada proses pengiriman bisnis jual beli tanaman" sebagai salah satu syarat kelulusan studi strata (S1). Kuesioner ini merupakan salah satu alat yang saya gunakan untuk mengumpulkan data dalam penelitian Tugas Akhir saya. Tujuan dari penelitian ini adalah untuk menciptakan produk baru berupa kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman bisnis jual beli tanaman yang sesuai dengan kebutuhan para penjual tnaman sehingga diharapkan pada proses jual beli tanaman online penjual dapat melakukan transaksi jual beli tanaman sesuai dengan yang diharapkan.

1. Nama

_____

2. Domisili

_____

3. Umur

Centang semua yang sesuai.

- [ ] <17 Tahun
- [ ] 17-25 Tahun
- [ ] 26-35 Tahun
- [ ] 36-45 Tahun
- [ ] >45 Tahun

4. Jenis Kelamin

Centang semua yang sesuai.

- [ ] Laki laki
- [ ] Perempuan

5. Jenis Tanaman Apakah Yang Pernah Anda Kirim Dalam Bisnis Jual Beli Tanaman?

Centang semua yang sesuai.

- [ ] Tanaman Buah
- [ ] Tanaman Hias
- [ ] Tanaman Konsumsi
- [ ] Tanaman Kayu
- [ ] Tanaman Obat

Yang lain: [ ] _____

6. Apakah Anda Pernah Mengalami Kerugian Yang Disebabkan Oleh Kemasan Dalam Proses Pengiriman Tanaman?

Centang semua yang sesuai.

- [ ] Pernah
- [ ] Tidak Pernah

7. Menurut Anda Faktor Apasajakah Yang Ada Pada Kemasan Yang Pernah Anda Temui Yang Mungkin Menyebabkan Kerugian Pada Proses Pengiriman Tanaman?

Centang semua yang sesuai.

- [ ] Biaya Mahal
- [ ] Waktu Pengemasan Lama
- [ ] Kekuatan Kemasan Kurang
- [ ] Kurang Menarik Untuk Dilihat
- [ ] Tidak Ramah Lingkungan
- [ ] Tidak Praktis
- [ ] Terlalu Berat Sehingga Menambah Biaya Ongkos Kirim
- [ ] Menghabiskan Banyak Tenaga
- [ ] Memerlukan Banyak Bahan
- [ ] Memerlukan Banyak Alat

Yang lain: [ ] _____

8. Apakah Bahan Utama Yang Anda Gunakan Untuk Pengemasan Tanaman?

Centang semua yang sesuai.

- [ ] Kardus
- [ ] Kayu
- [ ] Karung
- [ ] Kertas
- [ ] Sterofoam
- [ ] Plastik

Yang lain: [ ] _____

9. Design Kemasan Seperti Apa Yang Anda Butuhkan?

Centang semua yang sesuai.

- [ ] Kuat
- [ ] Ramah Lingkungan
- [ ] Murah
- [ ] Bentuk Menarik
- [ ] Praktis
- [ ] Awet
- [ ] Bentuk Unik
- [ ] Mudah Dibawa
- [ ] Dapat Digunakan Berkali Kali
- [ ] Ringan
- [ ] Nyaman Digenggam
- [ ] Tahan Air
- [ ] Tahan Guncangan
- [ ] Ada Informasi Spesifikasi Isi
- [ ] Ada Informasi Pengirim
- [ ] Mudah Di ingat
- [ ] Motif Menarik
- [ ] Bisa Di Bolak Balik
- [ ] Mudah Di Buka
- [ ] Mengemas 1 Produk Dengan 1 Kemasan
- [ ] Mengemas Banyak Produk Dengan 1 Kemasan
- [ ] Modern

Yang lain: ☐ _____

ATTACHMENT 2

Semantic Differential 1 Questionnaire

KUESIONER PENELITIAN DESIGN KEMASAN UNTUK TANAMAN PADA PENGIRIMAN TANAMAN (SEMANTIC DIFFERENTIAL 1 QUESTIONNAIRE)

Assalamualaikum Warahmatullahi Wabarakatuh.
Perkenalkan nama saya Nurman Gesit Rianto Mahasiswa Teknik Industri Universitas Islam Indonesia angkatan 2014. Pada saat ini saya sedang melaksanakan Tugas Akhir untuk "Men design kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman pada proses pengiriman bisnis jual beli tanaman" sebagai salah satu syarat kelulusan studi strata (S1). Kuesioner ini merupakan salah satu alat yang saya gunakan untuk mengumpulkan data dalam penelitian Tugas Akhir saya. Tujuan dari penelitian ini adalah untuk menciptakan produk baru berupa kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman bisnis jual beli tanaman yang sesuai dengan kebutuhan para penjual tnaman sehingga diharapkan pada proses jual beli tanaman online penjual dapat melakukan transaksi jual beli tanaman sesuai dengan yang diharapkan.

1. Nama

_____

2. Lama Bekerja Menjual Tanaman (Lama Terjun Didalam Dunia Tanaman)

Centang semua yang sesuai.

- [ ] <10 Tahun
- [ ] >10 Tahun

Tatacara Mengisi Kuesioner

Isilah kuesioner dibawah ini dengan mencentang atau dengan mencoret kolom yang disediakan berdasarkan pendapat anda mengenai tingkat kepentingan suatu atribut yang harus tersedia pada suatu design kemasan seusuai dengan nomor yang tersedia.

keterangan nomor

1 berarti element itu sangat tidak penting untuk ada pada sebuah design kemasan
2 berarti element itu tidak penting untuk ada pada sebuah design kemasan
3 berarti element itu tidak masalah atau netral untuk ada maupun tidak ada pada sebuah design kemasan
4 berarti element itu penting untuk ada pada sebuah design kemasan
5 berarti element itu sangat penting untuk ada pada sebuah design kemasan

3. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Kuat	◯	◯	◯	◯	◯	Kuat

4. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Ramah Lingkungan	◯	◯	◯	◯	◯	Ramah Lingkungan

5. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Mahal	◯	◯	◯	◯	◯	Murah

6. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Bentuk Tidak Menarik	◯	◯	◯	◯	◯	Bentuk Menarik

7. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Praktis	◯	◯	◯	◯	◯	Praktis

8. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Awet	◯	◯	◯	◯	◯	Awet

9. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Bentuk Biasa	◯	◯	◯	◯	◯	Bentuk Unik

10. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Sulit Dibawa	◯	◯	◯	◯	◯	Mudah Dibawa

11. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Sekali Pakai	◯	◯	◯	◯	◯	Dapat Digunakan Berkali Kali

12. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Berat	◯	◯	◯	◯	◯	Ringan

13. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Nyaman Digenggam	◯	◯	◯	◯	◯	Nyaman Digenggam

14. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Tahan Air	◯	◯	◯	◯	◯	Tahan Air

15. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Tahan Guncangan	◯	◯	◯	◯	◯	Tahan Guncangan

16. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Ada Informasi Isi	◯	◯	◯	◯	◯	Ada Informasi Isi

17. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Ada Informasi Pengirim	◯	◯	◯	◯	◯	Ada Informasi Pengirim

18. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Sulit Di Ingat	◯	◯	◯	◯	◯	Mudah Di Ingat

19. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Motif Biasa	◯	◯	◯	◯	◯	Motif Menarik

20. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Bisa Dibolak Balik	◯	◯	◯	◯	◯	Bisa Dibolak balik

21. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Sulit Dibuka	◯	◯	◯	◯	◯	Mudah Dibuka

22. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Mengemas Banyak Produk Dengan 1 Kemasan	◯	◯	◯	◯	◯	Mengemas 1 Produk Dengan 1 Kemasan

23. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Mengemas 1 Produk Dengan 1 Kemasan	◯	◯	◯	◯	◯	Mengemas Banyak Produk Dengan 1 Kemasan

24. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Modern	◯	◯	◯	◯	◯	Modern

25. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Rapi	◯	◯	◯	◯	◯	Rapi

26. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Aman	◯	◯	◯	◯	◯	Aman Tidak Rusak

27. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Tahan Banting	◯	◯	◯	◯	◯	Tahan Banting

28. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Simple	◯	◯	◯	◯	◯	Simple

29. Seberapa Pentingkah Atribut Dibawah Ada Pada rancangan pengepakan tanaman untuk paket pengiriman?

Tandai satu oval saja.

	1	2	3	4	5	
Tidak Menggunakan Cover Plastik	◯	◯	◯	◯	◯	Menggunakan Cover Plastik

30. Kritik dan Saran

ATTACHMENT 3

Item and Product Specification Questionnaire

Questionnaire Pemilihan Spesifikasi

Assalamualaikum Warahmatullahi Wabarakatuh.
Perkenalkan nama saya Nurman Gesit Rianto Mahasiswa Teknik Industri Universitas Islam Indonesia angkatan 2014. Pada saat ini saya sedang melaksanakan Tugas Akhir untuk "Men design kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman pada proses pengiriman bisnis jual beli tanaman" sebagai salah satu syarat kelulusan studi strata (S1). Kuesioner ini merupakan salah satu alat yang saya gunakan untuk mengumpulkan data dalam penelitian Tugas Akhir saya. Tujuan dari penelitian ini adalah untuk menciptakan produk baru berupa kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman bisnis jual beli tanaman yang sesuai dengan kebutuhan para penjual tnaman sehingga diharapkan pada proses jual beli tanaman online penjual dapat melakukan transaksi jual beli tanaman sesuai dengan yang diharapkan.

1. Nama

_____

2. domisili

_____

3. Lama berjualan tanaman

Centang semua yang sesuai.

- [ ] <10 tahun
- [ ] >10 tahun

4. Dari spesifikasi dibawah ini, manakah yang menurut anda kuat?

Centang semua yang sesuai.

- [ ] berbahan dasar kayu
- [ ] berbahan dasar bambu
- [ ] berbahan dasar rotan
- [ ] berbahan dasar kardus
- [ ] berbahan dasar plastik
- [ ] berbahan dasar sterofoam
- [ ] dirakit menggunakan paku
- [ ] dirakit menggunakan pengunci seperti puzzle
- [ ] dirakit menggunakan tali bambu
- [ ] dirakit menggunakan tali kayu
- [ ] dirakit menggunakan lem

Yang lain: [ ] _____

5. Dari spesifikasi dibawah ini, manakah yang menurut anda ramah lingkungan?

Centang semua yang sesuai.

- [ ] berbahan dasar kayu
- [ ] berbahan dasar bambu
- [ ] berbahan dasar rotan
- [ ] berbahan dasar kardus
- [ ] berbahan dasar plastik
- [ ] berbahan dasar sterofoam

Yang lain: [ ] _____

6. Dari spesifikasi dibawah ini, manakah yang menurut anda murah?

Centang semua yang sesuai.

- [ ] berbahan dasar kayu
- [ ] berbahan dasar bambu
- [ ] berbahan dasar rotan
- [ ] berbahan dasar kardus
- [ ] berbahan dasar plastik
- [ ] berbahan dasar sterofoam
- [ ] dibeli dari vendor termurah
- [ ] diambil dari bahan bekas tak terpakai

Yang lain: [ ] _____

7. Dari spesifikasi dibawah ini, manakah yang menurut anda praktis?

Centang semua yang sesuai.

- [ ] design lipat
- [ ] design rangkaian puzzle

Yang lain: [ ] _____

8. Dari spesifikasi dibawah ini, manakah yang menurut anda awet?

Centang semua yang sesuai.

- [ ] berbahan dasar kayu
- [ ] berbahan dasar bambu
- [ ] berbahan dasar rotan
- [ ] berbahan dasar kardus
- [ ] berbahan dasar plastik
- [ ] berbahan dasar sterofoam

Yang lain: [ ] _____

9. Dari spesifikasi dibawah ini, manakah yang menurut anda mudah untuk dibawa?

Centang semua yang sesuai.

- [ ] menambahkan pegangan dari dalam material utama
- [ ] menambahkan pegangan tambahan
- [ ] menambahkan tali lentur untuk pegangan

Yang lain: [ ] _____

10. Dari spesifikasi dibawah ini, manakah yang menurut anda tahan air?

Centang semua yang sesuai.

- [ ] menambahkan tambahan bungkus plastik
- [ ] menambahkan cat karet anti air
- [ ] menambahkan cat anti air
- [ ] membuat design dengan material bambu
- [ ] membuat design dengan material sterofoam
- [ ] membuat design dengan material plastik

Yang lain: [ ] _____

11. Dari spesifikasi dibawah ini, manakah yang menurut anda modern?

Centang semua yang sesuai.

- [ ] menambahkan warna modern

Yang lain: [ ] _____

12. Dari spesifikasi dibawah ini, manakah yang menurut anda aman?

Centang semua yang sesuai.

- [ ] membuat design melingkar tanpa sisi
- [ ] membuat material tebal
- [ ] menambahkan material pelindung tambahan

Yang lain: [ ] _____

13. Dari spesifikasi dibawah ini, manakah yang menurut anda tahan banting?

Centang semua yang sesuai.

- [ ] berbahan dasar kayu
- [ ] berbahan dasar bambu
- [ ] berbahan dasar rotan
- [ ] berbahan dasar kardus
- [ ] berbahan dasar plastik
- [ ] berbahan dasar kardus sterofoam
- [ ] membuat design melingkar tanpa sisi
- [ ] menambahkan bubble wrap
- [ ] menambahkan spons
- [ ] menambahkan karet
- [ ] menambahkan sterofoam

Yang lain: [ ] _____

14. Dari spesifikasi dibawah ini, manakah yang menurut anda simple?

Centang semua yang sesuai.

- [ ] membuat design dengan warna polos
- [ ] membuat design dengan 2 warna

Yang lain: [ ] _____

ATTACHMENT 4

Product Validation Questionnaire

Questionnaire Validasi

Assalamualaikum Warahmatullahi Wabarakatuh.
Perkenalkan nama saya Nurman Gesit Rianto Mahasiswa Teknik Industri Universitas Islam Indonesia angkatan 2014. Pada saat ini saya sedang melaksanakan Tugas Akhir untuk "Men design kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman pada proses pengiriman bisnis jual beli tanaman" sebagai salah satu syarat kelulusan studi strata (S1). Kuesioner ini merupakan salah satu alat yang saya gunakan untuk mengumpulkan data dalam penelitian Tugas Akhir saya. Tujuan dari penelitian ini adalah untuk menciptakan produk baru berupa kemasan yang digunakan untuk mengemas tanaman pada proses pengiriman bisnis jual beli tanaman yang sesuai dengan kebutuhan para penjual tnaman sehingga diharapkan pada proses jual beli tanaman online penjual dapat melakukan transaksi jual beli tanaman sesuai dengan yang diharapkan.

1. Nama

_____

2. domisili

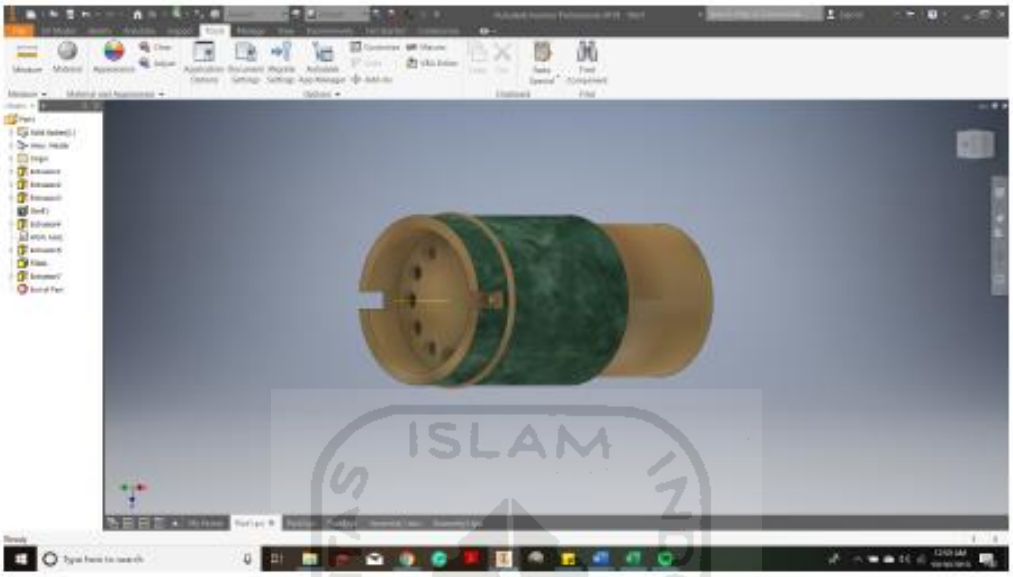
_____

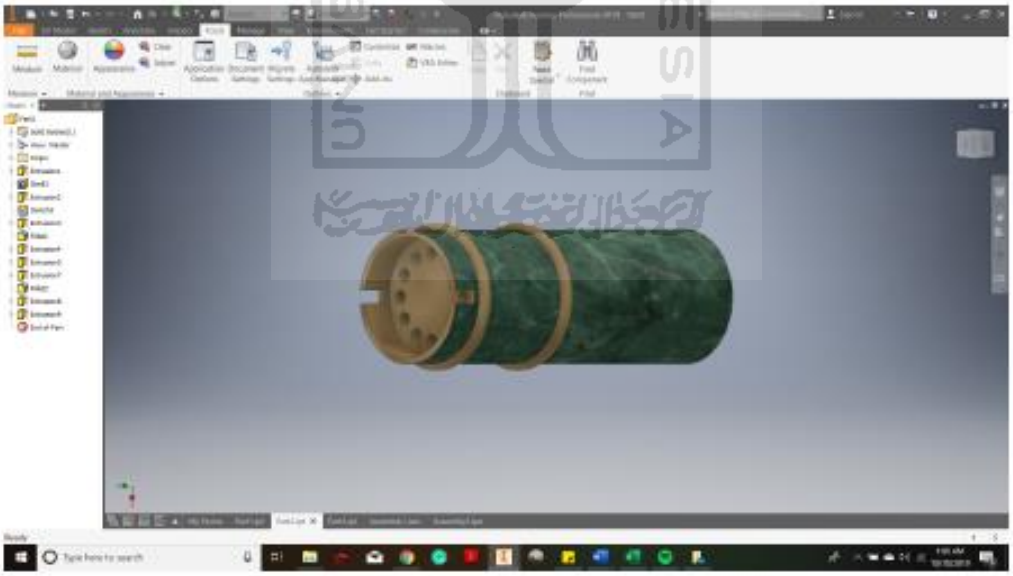
3. lama berjualan tanaman

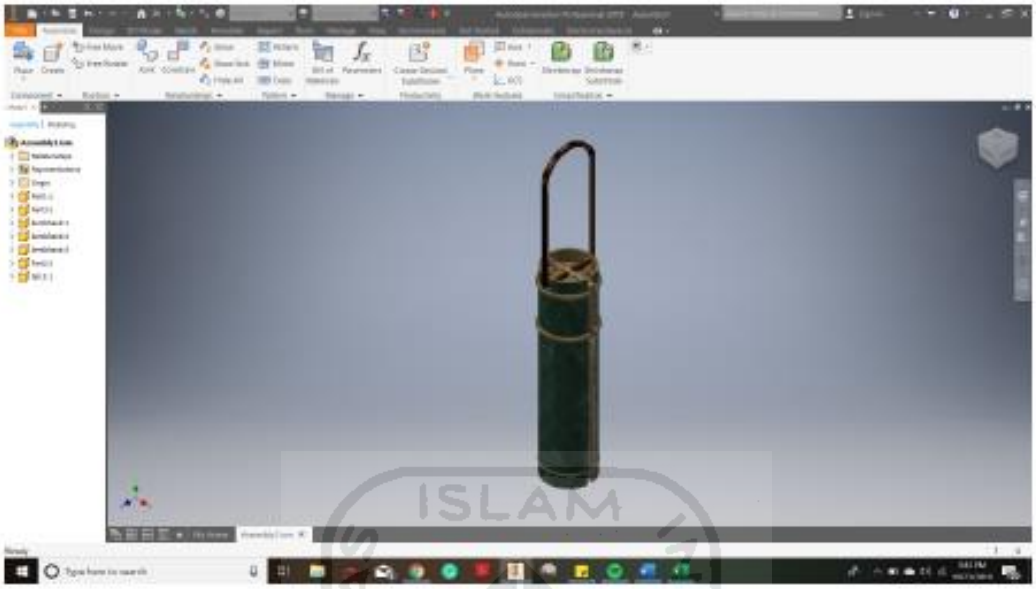
Centang semua yang sesuai.

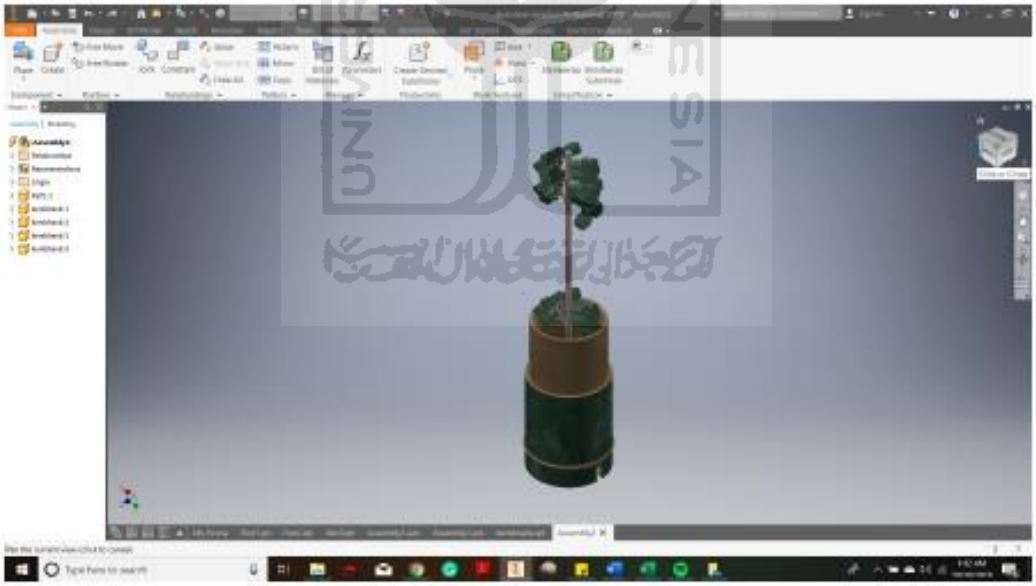
- [ ] <10tahun
- [ ] >10tahun

berikan saya pendapat anda tentang rancangan design kemasan yang saya buat









4. Menurut anda, apakah rencana rancangan design kemasan diatas kuat?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] Normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

5. Menurut anda, apakah rencana rancangan design kemasan diatas ramah lingkungan?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

6. Menurut anda, apakah rencana rancangan design kemasan diatas murah?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

7. Menurut anda, apakah rencana rancangan design kemasan diatas praktis?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

8. Menurut anda, apakah rencana rancangan design kemasan diatas awet?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] Setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

9. Menurut anda, apakah rencana rancangan design kemasan diatas mudah untuk dibawa?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

10. Menurut anda, apakah rencana rancangan design kemasan diatas tahan air?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

11. Menurut anda, apakah rencana rancangan design kemasan diatas modern?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

12. Menurut anda, apakah rencana rancangan design kemasan diatas aman?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

13. Menurut anda, apakah rencana rancangan design kemasan tahan banting?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

14. Menurut anda, apakah rencana rancangan design kemasan diatas simple?

Centang semua yang sesuai.

- [ ] sangat amat setuju
- [ ] sangat setuju
- [ ] setuju
- [ ] normal
- [ ] tidak setuju
- [ ] sangat tidak setuju
- [ ] sangat amat tidak setuju

ATTACHMENT 5

SEMANTIC DIFFERENTIAL 1 QUESTIONNAIRE RESULT

Name	Strong	Environmentally Friendly	Cheap	Attractive Shape	Practical	Durable	Unique Shape	Easy to Carry	Can Be Used Many Times	Light	Comfortable to Hold	Waterproof	Shock Resistant	There is Specification Information	There is Sender Information	Easy to Remember	Interesting Motive	Can be Reversed	Easy to Open	Pack 1 Product With 1 Pack	Pack Lots of Products with 1 Pack	Modern	Neat	Safe	Resilient	Simple	With Plastic Cover
Sukardi	5	5	5	1	5	5	1	4	5	5	5	5	5	5	1	2	1	5	5	1	5	1	5	5	5	5	5
Kamto	5	5	5	5	5	5	1	5	1	5	5	5	5	1	1	1	1	5	5	5	1	1	5	5	5	5	1
Supri	5	5	5	1	5	5	1	5	1	5	5	5	5	1	5	2	1	5	5	5	1	1	5	5	5	5	1
Suprianto kodirin	5	5	5	5	5	5	5	5	5	5	5	5	5	1	1	1	5	5	5	1	5	5	5	5	5	5	5
Suprianto suwanto	5	4	5	2	5	2	1	2	1	5	4	5	5	4	4	2	1	5	5	1	5	1	5	5	5	5	1
Sukardi	4	1	5	5	4	2	2	4	1	5	2	1	5	1	2	2	1	5	5	1	5	1	5	5	4	5	1
Sujianto (Gondrong)	3	4	4	1	4	1	1	2	2	4	2	5	4	5	5	1	1	5	5	5	1	2	5	4	5	4	5
Soleh	5	5	5	5	4	5	5	4	2	4	5	1	4	1	4	2	2	4	4	5	1	1	4	4	4	4	1
Pras	4	1	4	1	5	4	4	2	5	4	1	1	5	5	5	2	2	5	4	1	5	2	4	5	5	5	1
Sarhudin	4	5	4	5	4	5	1	5	4	4	5	5	4	1	4	1	1	4	4	5	1	2	5	4	4	4	5
Sukadi	5	4	5	1	5	5	2	2	5	5	1	5	5	2	1	2	4	5	5	5	1	1	5	5	4	5	5
Tiyo sobirin	5	5	5	1	5	5	1	5	5	5	5	5	5	5	5	2	2	5	5	5	1	1	5	5	5	5	5
Teguh	5	5	5	1	5	5	1	5	5	5	1	5	5	5	1	3	1	5	5	5	1	1	5	5	5	5	1
Wahyudi tarman	5	4	5	2	5	5	2	3	5	5	5	5	5	1	1	1	1	5	5	1	5	1	5	5	5	5	1
Rudianto	5	3	5	1	5	5	2	5	5	5	1	5	5	5	1	3	1	5	5	1	5	1	5	5	5	5	1
Zaenal	5	5	5	1	5	5	2	5	5	5	1	5	5	5	1	2	1	5	5	1	5	2	5	5	5	5	1
Hardi	5	5	5	1	5	5	1	5	5	5	5	5	5	1	1	2	1	5	5	1	5	5	5	5	5	5	1
Kodirin	5	5	5	5	5	5	1	5	5	5	1	5	5	5	1	1	1	5	5	5	1	5	5	5	5	5	1
Khoerudin	5	5	5	3	5	5	1	5	5	5	5	5	5	1	1	1	1	5	5	1	5	5	5	5	5	5	1
Yuli	5	5	5	1	5	5	1	5	5	5	5	5	5	5	1	1	5	5	5	1	5	5	5	5	5	5	1
Toro (Guteng)	4	5	5	1	5	5	2	5	1	5	5	4	5	1	1	1	3	5	5	1	5	1	5	5	5	5	5
Hendrik	5	4	4	1	5	5	1	5	1	5	5	4	4	5	5	2	1	4	5	1	5	1	5	5	4	4	5
Darman	4	5	4	2	4	1	1	5	5	4	5	4	4	2	1	1	1	5	4	1	5	1	4	4	4	4	5
Adi	4	4	4	1	4	1	2	4	5	5	5	5	4	1	1	3	3	4	4	5	1	1	5	4	4	5	5
Rahmat	4	5	4	4	4	4	4	5	1	4	4	5	5	2	1	3	3	4	4	5	1	2	4	4	5	4	5
Andi	4	5	5	2	4	4	2	5	5	4	5	5	4	2	1	2	1	4	4	1	5	1	5	4	5	4	5
Rohman	4	4	4	1	4	4	2	5	5	4	5	5	5	2	4	2	3	4	5	5	1	2	5	4	5	5	4
Soeharno	5	5	5	4	5	5	4	5	5	4	4	4	4	1	1	3	2	5	4	1	5	2	4	5	5	5	5
Karto	4	4	4	1	4	1	1	5	5	4	3	5	4	2	4	1	3	4	4	1	5	1	5	4	5	4	4
Damar	5	4	5	5	5	5	5	5	1	4	3	4	4	1	1	1	4	5	5	1	5	2	4	4	4	5	5

ATTACHMENT 6

SPSS Output of Validity Test (1st Iteration)

NO	KANSEI WORD	Pearson corelation	r-table	Description
1	Strong	0.594	0.361	Valid
2	Environmentally friendly	0.563	0.361	Valid
3	Cheap	0.414	0.361	Valid
4	Attractive shape	0.067	0.361	Invalid
5	Practical	0.564	0.361	Valid
6	Durable	0.685	0.361	Valid
7	Unique Shape	0.108	0.361	Invalid
8	Easy to carry	0.436	0.361	Valid
9	Can Be Used Many Times	0.345	0.361	Invalid
10	Light	0.332	0.361	Invalid
11	Comfortable to Hold	0.261	0.361	Invalid
12	Waterproof	0.469	0.361	Valid
13	Shock Resistant	0.336	0.361	Invalid
14	There is specification information	0.129	0.361	Invalid
15	There is Sender information	-0.246	0.361	Invalid
16	Easy to remember	-0.058	0.361	Invalid
17	Interesting Motive	0.379	0.361	Valid
18	Can be reversed	0.204	0.361	Invalid
19	Easy to Open	0.353	0.361	Invalid
20	Pack 1 Product With 1 Pack	-0.015	0.361	Invalid
21	Pack Lots of Products with 1 Pack	0.015	0.361	Invalid
22	Modern	0.557	0.361	Valid
23	Neat	0.184	0.361	Invalid
24	Safe	0.386	0.361	Valid
25	Resilient	0.384	0.361	Valid
26	Simple	0.384	0.361	Valid
27	With Plastic Cover	0.121	0.361	Invalid

ATTACHMENT 7

SPSS Output of Validity Test 1 (2nd Iteration)

NO	KANSEI WORD	Pearson corelation	r-table	Description
1	Strong	0.687	0.361	Valid
2	Environmentally friendly	0.592	0.361	Valid
3	Cheap	0.586	0.361	Valid
4	Practical	0.676	0.361	Valid
5	Durable	0.73	0.361	Valid
6	Easy to carry	0.489	0.361	Valid
7	Waterproof	0.53	0.361	Valid
8	Interesting Motive	0.305	0.361	Invalid
9	Modern	0.615	0.361	Valid
10	Safe Not Damaged	0.498	0.361	Valid
11	Resilient	0.443	0.361	Valid
12	Simple	0.506	0.361	Valid

ATTACHMENT 8

SPSS Output of Validity Test (3rd Iteration)

NO	KANSEI WORD	Pearson corelation	r-table	Description
1	Strong	0.687	0.361	Valid
2	Environmentally friendly	0.592	0.361	Valid
3	Cheap	0.586	0.361	Valid
4	Practical	0.676	0.361	Valid
5	Durable	0.73	0.361	Valid
6	Easy to carry	0.489	0.361	Valid
7	Waterproof	0.53	0.361	Valid
8	Modern	0.615	0.361	Valid
9	Safe Not Damaged	0.498	0.361	Valid
10	Resilient	0.443	0.361	Valid
11	Simple	0.506	0.361	Valid

ATTACHMENT 9

SPSS Output of Reliability Test

NO	KANSEI WORD	Cronbach's Alpha	r-table	Description
1	Strong	0.762	0.349	Reliable
2	Environmentally friendly	0.762	0.349	Reliable
3	Cheap	0.762	0.349	Reliable
4	Practical	0.762	0.349	Reliable
5	Durable	0.762	0.349	Reliable
6	Easy to carry	0.762	0.349	Reliable
7	Waterproof	0.762	0.349	Reliable
9	Modern	0.762	0.349	Reliable
10	Safe Not Damaged	0.762	0.349	Reliable
11	Resilient	0.762	0.349	Reliable
12	Simple	0.762	0.349	Reliable

Reliability Statistics	
Cronbach's Alpha	N of Items
0.762	11

ATTACHMENT 10

SPSS Output of Normality Test to Prove This Research Data are not Normal and Should use Nonparametric Statistical Test

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Respondent_Name	Statistic	df	Sig.	Statistic	df	Sig.
choices_Strength	Budi	.492	11	.000	.486	11	.000
	Leo	.395	11	.000	.696	11	.000
	Toyibah	.382	11	.000	.701	11	.000
	Teguh	.401	11	.000	.625	11	.000
	Masiah	.382	11	.000	.701	11	.000
	Tono Kating	.432	11	.000	.619	11	.000
	Giman	.300	11	.007	.703	11	.001
	anggoro	.482	11	.000	.504	11	.000
	Hendrik	.353	11	.000	.649	11	.000
	Handoyo	.432	11	.000	.619	11	.000
	Herdiansyah	.448	11	.000	.572	11	.000
	Ningsih	.433	10	.000	.594	10	.000
	Gianto	.460	12	.000	.552	12	.000
	Indra	.353	11	.000	.649	11	.000
	Aryo	.448	11	.000	.572	11	.000
	Deny	.353	11	.000	.649	11	.000
	Yanto	.300	11	.007	.703	11	.001
	Akbar	.414	11	.000	.574	11	.000
	Basiman	.353	11	.000	.649	11	.000
	Edwin	.401	11	.000	.625	11	.000

a. Lilliefors Significance Correction

ATTACHMENT 11

Item and Product Specification Determination option

No	level 0	level 1	level 2	level 3	physical design approach
1	Strong	packaging strength	strong material	Material selection	wood
					bamboo
					rotan
					cardboard
					plastic
					sterofoam
				Way to Assemble	nail
					puzzle lock
					rubber rope
					wooden rope
					bamboo rope
					glue
2	Environmentally friendly	packaging impact to environment after usage	easy soil decomposes material	Material selection	wood
					bamboo
					rotan
					cardboard
					plastic
					sterofoam
3	Cheap	packaging price	cheap price material	material selection	wood
					bamboo
					rotan
					cardboard
					plastic
					sterofoam

				vendor selection	cheapest vendor selection
					Abandoned Secondhand material
4	Practical	easy to use	easy to use packaging design	design the easiest to pack packaging	folding design
					puzzle design
5	Durable	packaging usage time	longlife material	material selection	wood
					bamboo
					rotan
					cardboard
					plastic
					sterofoam
6	Easy to carry	easy to bring	easy to carry packaging design	add extra grip	add intrnal handgrip
					add external handgrip
					add elastic handle by rope
7	Water Resistance	packaging resistance to water or not easy to broken material when get wet	water resistance material	add water resistance extra material	plastic
					waterproof paint
					rubber paint
				material selection	bamboo
					sterofoam
					plastic
8	Modern	packaging modern view	modern view design	add modern impression	put the modern colour
9	Safe	packaging safety	safe packaging design	design the safety packaging	make borderless design
					make bold material design
					add extra protection material
10	Resilient	packaging shape consistency to damage	taught material selection taught	material selection	wood
					bamboo
					rotan

			design orientation		cardboard
					plastic
					sterofoam
				add extra packaging protection	make borderless design,
					bubble wrap
					spoons
					rubber
					sterofoam
11	Simple	packaging simple view	simple view packaging design	reduce the unneeded view	make the solid view
					make 2 tone view

ATTACHMENT 12

Specification Option Percentage from Respondent

Strong Kansei word	Percentage	enviromentaly friendly word	Percentage	cheap word	Percentage
bamboo material based	90%	wood material based	5%	bamboo material based	85%
rotan material based	10%	bamboo material based	85%	paperboard material based	5%
assembled using nail	50%	rotan material based	10%	sterofoam matrial based	10%
assembled using bamboo rope	50%	paperboard material based	10%	Cheapest vendor selection	40%
				abandoned secondhand material	35%
Practical	Percentage	Durable word	Percentage	easy to carry word	Percentage
folding design	20%	Bamboo Meterial based	90%	add internal handgrip	10%
puzzle design	80%	rotan material based	10%	add external handgrip	5%
				add elastic handle by rope	85%
water resistance word	Percentage	modern word	Percentage	safe word	Percentage
add extra plastic material	55%	add modern color	100%	Borderless design	50%
Bamboo material based	60%	solid elegant	5%	Bold material design	45%
		simple	5%	add extra protection material	10%
resilient word	Percentage	simple word	Percentage		
bamboo material based	90%	make solid view	95%		
rotan material based	10%	make 2 tone view	5%		
borderless design	65%				
add bubble wrap	25%				
add sponge	5%				

ATTACHMENT 13

R-Table

DF = n-2	0,1	0,05	0,02	0,01	0,001
	r 0,005	r 0,05	r 0,025	r 0,01	r 0,001
1	0,9877	0,9969	0,9995	0,9999	1,0000
2	0,9000	0,9500	0,9800	0,9900	0,9990
3	0,8054	0,8783	0,9343	0,9587	0,9911
4	0,7293	0,8114	0,8822	0,9172	0,9741
5	0,6694	0,7545	0,8329	0,8745	0,9509
6	0,6215	0,7067	0,7887	0,8343	0,9249
7	0,5822	0,6664	0,7498	0,7977	0,8983
8	0,5494	0,6319	0,7155	0,7646	0,8721
9	0,5214	0,6021	0,6851	0,7348	0,8470
10	0,4973	0,5760	0,6581	0,7079	0,8233
11	0,4762	0,5529	0,6339	0,6835	0,8010
12	0,4575	0,5324	0,6120	0,6614	0,7800
13	0,4409	0,5140	0,5923	0,6411	0,7604
14	0,4259	0,4973	0,5742	0,6226	0,7419
15	0,4124	0,4821	0,5577	0,6055	0,7247
16	0,4000	0,4683	0,5425	0,5897	0,7084
17	0,3887	0,4555	0,5285	0,5751	0,6932
18	0,3783	0,4438	0,5155	0,5614	0,6788
19	0,3687	0,4329	0,5034	0,5487	0,6652
20	0,3598	0,4227	0,4921	0,5368	0,6524
21	0,3515	0,4132	0,4815	0,5256	0,6402
22	0,3438	0,4044	0,4716	0,5151	0,6287
23	0,3365	0,3961	0,4622	0,5052	0,6178
24	0,3297	0,3882	0,4534	0,4958	0,6074
25	0,3233	0,3809	0,4451	0,4869	0,5974
26	0,3172	0,3739	0,4372	0,4785	0,5880
27	0,3115	0,3673	0,4297	0,4705	0,5790
28	0,3061	0,3610	0,4226	0,4629	0,5703
29	0,3009	0,3550	0,4158	0,4556	0,5620
30	0,2960	0,3494	0,4093	0,4487	0,5541
31	0,2913	0,3440	0,4032	0,4421	0,5465
32	0,2869	0,3388	0,3972	0,4357	0,5392
33	0,2826	0,3338	0,3916	0,4296	0,5322
34	0,2785	0,3291	0,3862	0,4238	0,5254
35	0,2746	0,3246	0,3810	0,4182	0,5189
36	0,2709	0,3202	0,3760	0,4128	0,5126
37	0,2673	0,3160	0,3712	0,4076	0,5066
38	0,2638	0,3120	0,3665	0,4026	0,5007
39	0,2605	0,3081	0,3621	0,3978	0,4950
40	0,2573	0,3044	0,3578	0,3932	0,4896
41	0,2542	0,3008	0,3536	0,3887	0,4843
42	0,2512	0,2973	0,3496	0,3843	0,4791

ATTACHMENT 14

Research Moment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