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Design of Kansei Engineering System (KES) for the Effectiveness of Product Search Functions in E-Commerce by Emotion Category

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Abstract---*The essence of a product will greatly affect one's interest in the product, as well as will give an idea of the impression of the product. Kansei Engineering is a method of determining product design based on feelings or emotions. The design of the product will be translated into emotions that humans have. A brightly colored plate with a flower shape can be interpreted as a cheerful emotion. This makes humans have an attachment to the product because of emotional connections. Therefore, this research will implement the kansei engineering method for products in e-commerce. These goals are motivated by e-commerce trends that will continue to grow in the future. The results of this study are in the form of a Kansei system design to search products in e-commerce catalogs based on emotions. The conclusion of this research is to be able to arrange the best product search algorithm based on emotions and Kansei system design with the main function of product search based on emotions. Based on the results obtained, further research is expected to use a particular algorithm to automate the knowledge base processing that is needed in KES.*

(Keywords*---AHP, Anlytical Hierarchy Process, Kansei Engineering System, Kansei Type II, Decision Support System, DSS)*

I. Introduction

Kansei is a Japanese word which when translated has the meaning of feeling, image, emotion, taste or impression. KE is a methodology that unites Kansei with engineering discipline, a field where product development that brings happiness and satisfaction to humans is done by using technology by analyzing humans and incorporating it into product design. KE is classified into three types namely KE Type I, KE Type II and KE Type III. KE Type II is an EC implementation that utilizes today's computers such as decision support systems, expert systems and neural network models. Another name for KE Type II is the Kansei Engineering System (KES), where the KE method is interpreted as a computer system. There are two ways to implement EC into the system, namely as a decision support for customers and decision support for designers in the development of a product [1]. Previous research that has been done is KES supporting customer decisions for women's fashion called the Fashion Image System (FAIMS) and KES for home design named Human Living System (HULIS) [2]. Based on this explanation it can be stated that EC can be implemented not only on one particular type of product. KES can

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be used to process more than products with the same assessment specifications. Therefore, one of the benefits of KES is that it can maximize the implementation of KE that is not limited to only counting one object.

In this study, the KE method will be used to help buyers determine the product that is in accordance with the desired emotion. This is motivated by the marketing trends of today's cooking products compared to marketing techniques through physical stores making e-commerce much in demand. The reason is efficient, easy, varied products and others. In addition, the main reason for people to shop is no longer because of necessity but rather to concentrate on appreciation [3]. The KE method will be applied to streamline the search function in the e-commerce system. Generally in e-commerce, grouping of product categories is only based on the type of goods or the price of goods. Nobody has grouped products by emotional category. So customers can search for products by choosing based on the desired emotional category. For the system to provide the appropriate output each product contained in a shopping catalog must already have a certain emotional category. Therefore the KE process is carried out when entering new products. The KE process is generally to collect categories of emotions or kansei words, then divide the product design into elements that will be judged based on kansei words. While in this study the process will change in line as shown in Figure 1. The system will interpret the design elements into words. After that, the output of the product search function is the result calculated using the Analytical Hierarchy Process (AHP).

The purpose of this study is to determine the KES algorithm in the search function, as well as provide a reference to the design of KES for effective product search functions in e-commerce based on buyer emotions. The system design will be carried out using usecase diagrams, class diagrams, activity diagrams and sequence diagrams to determine the main processes needed in system development. Future studies are expected to add algorithms to the knowledge base processing in the KES process in Figure 1.

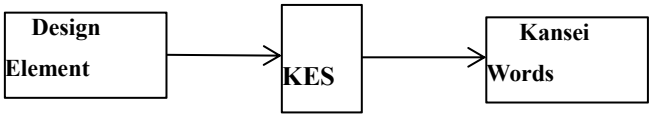


Figure 1. Product Translation Process into Kansei Words

II. LITERATURE REVIEW

Kansei Engineering (KE)

In Japanese, *Kansei* means sensitivity / I, whereas in English it is often referred to as Affective Engineering. Thus Kansei involves sensitivity, sensibility, feelings and emotional emotions that are harmonized through five senses; vision (hearing), hearing (hearing), smell (smell), feeling (taste), touch (skin sensation). The term *Kansei* was later translated in an engineering method so named Kansei Engineering. This method was first introduced by Mitsuo Nagamachi (Dean of Hiroshima International University) as a new engineering method in helping the process of design and development of industrial products that are oriented to human feelings.

KE is an effective technique for translating *Kansei* people (consumers' feelings and desires for domain products) into product design elements. Recently, this technique has been implemented in various fields of product development. Actually the concept of EC is widely referred to in the product design process. Furthermore, KES functions as an interface between product designers and product consumers. The two main functions found in KES are Consumer’s decision supporting and Designer supporting systems [4]. This study designed KES which has specifications as Consumer’s decision supporting.

Analytical Hierarchy Process (AHP)

AHP is an analytical model that uses an organized mind or group of thoughts in the process of working to deal with the complexity that it captures. By using AHP, a problem will be solved in an organized frame of mind, so that it can be

expressed to make effective decisions on the problem. Complex issues can be simplified and accelerated the decision making process [5].

In using the AHP method, explaining there are some basic principles that must be understood, namely:

1. Decomposition

With this principle complex problem structures are divided into levels arranged hierarchically, and allow goals to be defined from general to specific. In the simplest form the hierarchical structure created will be divided into levels of objectives, criteria and alternatives. Each alternative set might be further divided into more detailed levels including more other criteria. The top level of the hierarchical structure is a goal consisting of one element. The next level is the criteria and alternatives that may contain several elements, where the elements can be compared, have almost the same importance and do not have too striking differences.

2. Comparative Judgments

With this principle a pairwise comparison of all elements will be built with the aim of producing a scale of the relative importance of each element.

3. Synthesis Priority (Synthesis of Priority)

In the synthesis of priorities, the concepts of local priorities and global priorities are known. Local priority (Local Priority) is obtained by calculating the vector eigenvalue in each pair comparison matrix at the same level. While global priority (Global Priority) is done by synthesizing local priorities.

III. RESEARCH METHODS

Identification of Problems

The problem in this study is based on the explanation in the introductory chapter. Identification of problems and suggested solutions can be seen in Table 1. There are two main problems, namely determining the algorithm and designing KES product search based on emotional categories.

Table 1. Identification of Problems

No	Identification of Problems	Solution
1	How to determine product search algorithms based on emotion categories?	Determine an algorithm based on the KE method, which is to determine kansei words on each product and then determine the best product based on groups of products with similar *kansei* words.
2	How to design the KE system for product search based on these emotional categories?	The system designed will have the main function of Product Entry and Product Search in Catalog, where Product Entry is the process of translating product design into kansei words while Product Search is the best product search process using the AHP method.

IV. Literature Study

Theories used to conduct this research are:

1. Kansei Engineering
2. Analytical Hierarchy Process

C. The experimental procedure

The experimental procedure is the process of carrying out the stages of research that can be seen in Figure 2. The Problem Identification Stage is the process of discussing solutions to the problems found, thus producing KES requirements. The next stage is the analysis of system requirements that will produce a provision of the main functions and scope of the system. The final stage is the design of the system based on the requirements and scope of the system discussed in the previous stage.

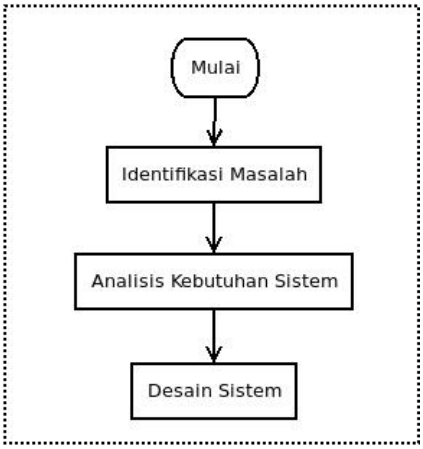


Figure 2. The experimental procedure

V. RESULTS AND DISCUSSION

Discussion on Identification of Problems

Two problems in Table. 1 namely determining the product search algorithm based on emotional categories and the design of the KES system for product search will be discussed in more detail. Before determining the algorithm and planning will be discussed in advance how to determine the variables used. Following is the discussion of problem identification:

1. Product Search Algorithm by Emotion Category

Before users can search for products based on emotional categories, products must be entered first and have the kansei words category. This stage is called the stage of translating the product into kansei words. The process can be seen in Figure. 3 where the explanation is to determine the type of product such as shoes, upper clothes, skirts, etc., compile Semantic Differentsial (SD), Selecting Kansei Words and then giving weight to each kansei words. Furthermore, product data that already has the value of kansei words will be stored.

Kansei words are words that can represent the expression of feelings towards a specimen by consumers. The words will be chosen based on the results of the emotional design theory in the previous research by [6] Gumulya and Natasia and obtained 25 words as in Table 2. The 25 words obtained will be used as candidates to be selected in the process of selecting kasnsei words in Figure 3 based on their suitability with emotions to be achieved in the product to consumers.

Furthermore, product search can be done by performing AHP calculations, where the variable criteria are filled by kansei words and alternatives are products with similar types of products. Can be seen in Figure 4 regarding the AHP calculation process.

Table 2. *Kansei* Words [8]

No	Affective	Description	No	Affective	Description
1	Amazed	Impress, appreciate	14	Friendly	Warm, friendly
No	**Affective**	**Description**	**No**	**Affective**	**Description**
2	Be entertained	Playful, funny, but laugh	15	Love	Dear, romantic
3	Looking forward to	Expect	16	Passionate	Excited
4	Confidence	Believe, believe, strong	17	Proud	Self Satisfaction
5	Courage	To be proud of	18	Make calm	Relax
6	Make Pensive	Dreaming of	19	Relieved	Be grateful
7	Fascinated	Full, moved	20	Respect	Appreciate
8	Simulated	Being energized, active	21	Satisfied	Fulfilled
9	Euphoria	ecstasy	22	Desire	Enchanting, desiring, making reflections
10	Interested	Want to know	23	Dumbfounded	Make a surprise
11	Make Wishing	optimistic	24	Sympathetic	Empathy
12	Inspired	tempted	25	Adore	Sponsorship
13	Happy	happy			

1. Perancangan KES untuk Pencarian Produk Berdasarkan Kategori Emosi

Perancangan KES untuk Pencarian Produk Berdasarkan Kategori Emosi dapat dilihat pada Gambar 5

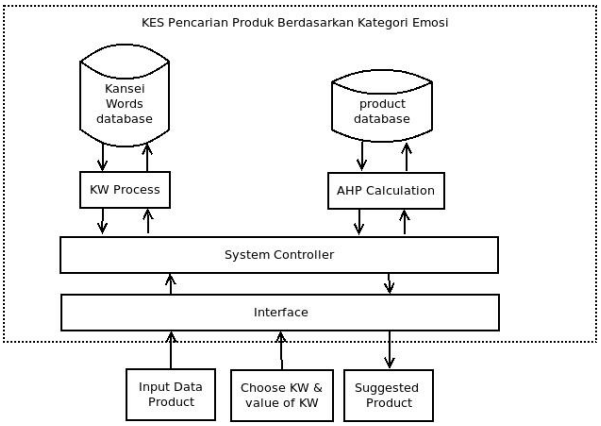
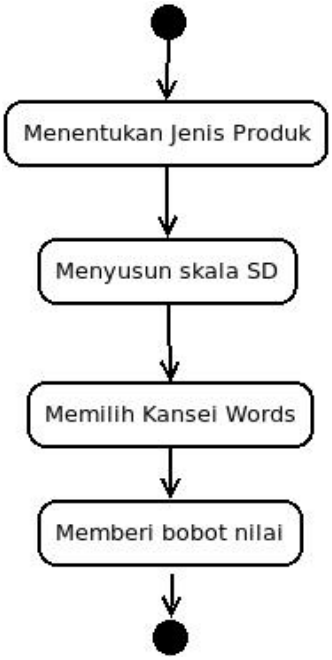
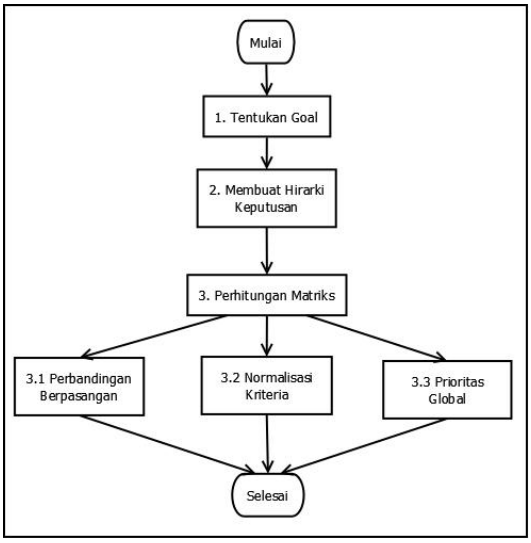


Figure 5. Designing the Case Search Product Based on Emotional Categories



Gambar 3. Algoritma Entri Produk



Gambar 4. Perhitungan AHP

B. Analisis Kebutuhan Sistem

Based on the results of the discussion in the previous sub-chapter, it can be determined that KES can be established with the requirements as in Table 3.

Table 3. KES Requirements Product Search by Em Categoryosi

No	Types of System Requirements	Description of Requirements
1	Functional	• *There are two types of access rights on the system, namely as Admin and Customer* • *The main functions of the system are: Kansei Words Entry,*

		Product Entry, Product Catalog, Product Search, Shopping Cart, Payment • *Admin has access to all functions, while Customers do not have access to Kansei Words and Product Entry functions.*
2	Non-functional	• The results of the search will be sorted by the most recommended products • The minimum number of Kansei Words (KW) selections is three KW per product.

C. Design System

The final stage is the KES design for e-commerce which is depicted using the usecase diagram (Figure 6) and the activity diagram (Figures 7 & 8). Explanation of usecase diagram can be seen in Table 4 and Table 5.

Table 4. Actor Descriptions

No	Actor	Descriptions
1	Admin	*Employees at e-commerce are tasked with managing the system, and have access to the main functions of product entry and kansei words entry*
	Customer	*Customers who are members of e-commerce.*

Table 5. Usecase Description

No	Usecase	Descriptions
1	Entri Product	The process of inputting products by Admin
2	Entri KW	The process of inputting Kansei Words by Admin
3	Catalog Product	Function to display products from e-commerce
4	Search Product	The function to search for products based on emotional categories
5	Details Product	The function displays detailed data of the product
6	Shopping Cart	Function for storing products to be purchased

7	Payment	Payment function after entering the product in the Shopping Cart.

Figure 7 is a product entry activity diagram, where the process can only be accessed by the admin. Admin will input product data in the form of product images, product names, product prices, then choose a minimum of three KW KW. If the KW selected is less than three, the system will ask to choose KW again. After selecting the KW, the Admin must add a weight value to the selected KW, as an assessment of the emotional elements of the product. Figure 8 is a Search Product activity diagram, in which the process will produce a recommended product output based on the emotional element chosen by the Customer. The process of determining the product will be calculated using AHP.

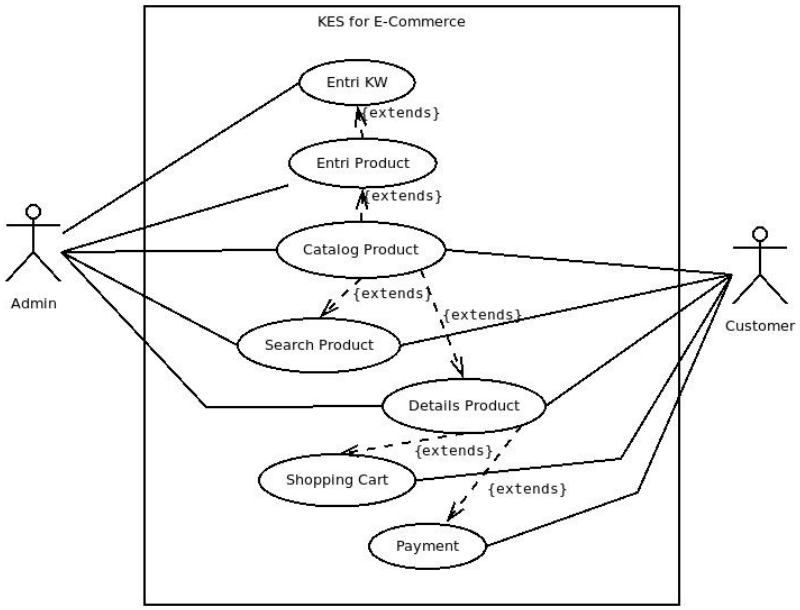
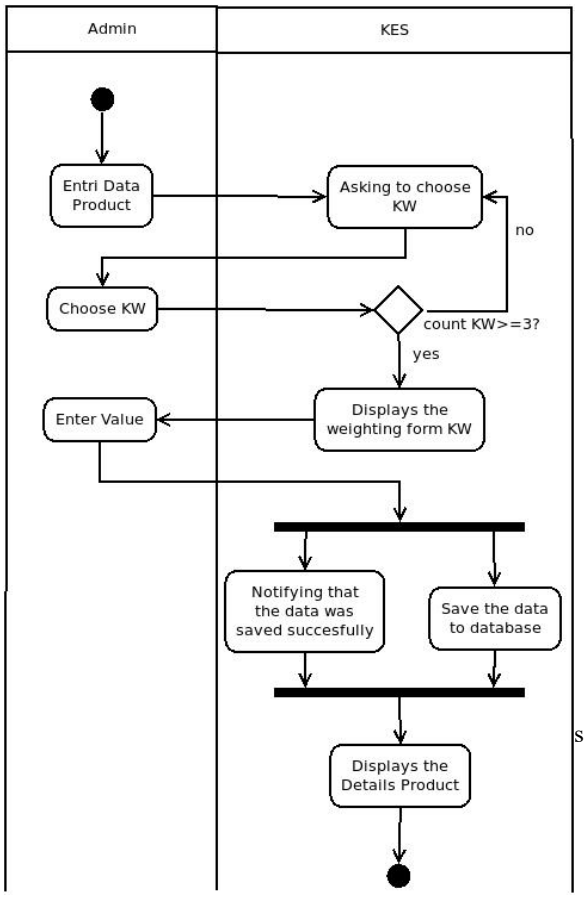


Figure 6. Usecase

Diaram KES product search by emotional category

VI. CONCLUSIONS AND RECOMMENDATIONS

Based on the scolding in this study, it can be concluded that the product search algorithm based on emotions can be determined using the KE and AHP methods to support its decision. The design of KES product search based on emotional categories can be applied to e-commerce by adding the KE method and AHP calculation to its main function. In addition, this research certainly has many shortcomings. Suggestions for further research that will discuss about KES to streamline product search, add a knowledge base as a basis for system knowledge to be able to provide automatic weighting without having to be input manually by the Admin.



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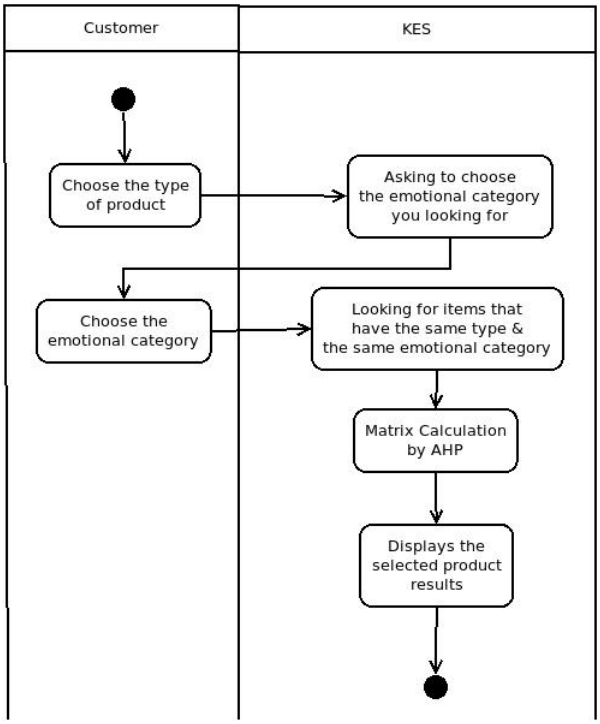

Figure 7 Product Entry Activity Diagram

Figure 8 Product Search Diagram Activity

REFERENCES

[1] Nagamachi, M., 2011. Kansei/Affective Engineering , CRC Press.
[2] Nagamachi, M., 1991a. An Image Technoloy Expert System and Its Application to Design Consutation. Inernational Journal of Human-Computer Intercion.Kansei/Affective Engineering , CRC Press.
[3] Norman, D. A. 2004. Emotional Design: Why We Love (or Hate) Everyday Things. New York: Basic Books.
[4] Nagamachi, M., 1995. Kansei Engineering: A new ergonomic consumer-oriented technology for product development. International Journal of Industrial Egronomics.
[5] Marimin, Nurul Maghfiroh. 2010. Aplikasi Teknik Pengambilan Keputusan dalam Rantai Pasok. Bogor: IPB Press.
[6] Gumulya & Natasia. 2015. “Kajian Teori Emotional Design”. Jurnal Desain.