JOURNAL OF SCIENCE INNOVARE
https://journal.unpak.ac.id/index.php/jsi

Volume 01, Number 01, February 2018
p-ISSN: 2615-3769 ; e-ISSN: 2615-3750

Kansei Engineering Approach in Software Interface Design

Indra Griha Tofik Isa*)

*)*Muhammadiyah University of Sukabumi, Sukabumi, Indonesia*
Corresponding Author: igtiku@ummi.ac.id

Abstract. User satisfaction is a major factor in designing a product. Technically it can be realized explicitly how the product is designed according to the needs of its users. There are other factors that influence the success of the product, the psychological value of the user who can implicitly become a parameter in product design. But the thing that becomes a constraint is how to translate these psychological factors into the parameters of product design. Kansei Engineering (KE) is one approach in product design that involves the user's psychological side and how to translate the cognitive aspects of the user into the product of the design proposal. The KE methods, the one discussed in this study, is Kansei Engineering Type 1 (KEPack), which involves several multivariate analyzes. The conclusion of this research is how KE in designing a product, not only industrial product, but KE can be involved in matters related to Human Computer Interaction, especially interface design.

Keywords: Product Development, Kansei Engineering, Kansei Engineering Type 1 (KEPack)

I. INTRODUCTION

The design and function of the product grow with the quality of the product itself. Customer satisfaction becomes the parameter reference in the design of a product that can be translated explicitly through in-depth interviews with users, providing questions in the questionnaire as well as analysis of market trends. Several methods of analysis have been developed in the product design in an effort to increase the number and selling value of these products, so as to increase profits. Among them are Quality Function Deployment (QFD), Conjoint Analysis, Voice of Costumer (VoC), Kansei Engineering (KE) (Lokman, 2010)

QFD is a structured approach how functionally translate user requirements into a product's design. This method was developed by Akao (1990) with 3 main objectives in its implementation (Akao, 1990), namely:

a. Prioritize the needs and wants of both spoken and unspoken consumers
b. Translating those needs into specifications and technical characteristics
c. Build and deliver a quality product or service with customer satisfaction

VoC is a term used in the business world that describes in-depth processes aimed at knowing and understanding customer's expectations, preferences, and dislikes of the goods or services offered. Actually VoC is part of market research techniques which presents reports on the wants and needs of customers are arranged in a hierarchical structure. The points in the report are then arranged by priority (according to the level of importance for customers and companies). VoC studies are usually performed with qualitative and quantitative analysis. This process is run before the company runs a new thing related to customer and profitability, including when it comes to issuing new products, new services, and including new processes.

Conjoint Analysis is a popular market analysis technique where marketers use it to determine what features are used in a new product and how to determine its selling value (Curry, 1996). Conjoint Analysis becomes very popular because it is flexible and does not require a high cost when compared with the concept of product first. In the analysis, conjoint analysis combines several attributes such as price, size, color, brand, etc.

Kansei Engineering (KE) is a product development technique where the parameters are the emotional psychological elements of the user. KE was developed by Mitsuo Nagamachi, a Japanese nationality in the 1970s. In general the KE technique follows a pattern like the following picture (Lokman and Nagamachi, 2010):

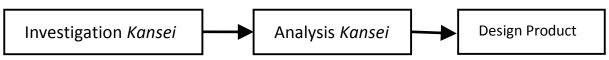

Figure 1. Kansei Engineering Flow

Some of the above mentioned product development techniques have one common goal: how to design products according to customer wants and expectations to achieve customer satisfaction. The reference parameters can be explicitly applied in QFD, VoA and Conjoint Analysis techniques, such as how color shapes, expected product functions, technology are used based on user desires, etc. But there are other

Volume 01, Number 01, February 2018
p-ISSN: 2615-3769 ; e-ISSN: 2615-3750

parameters that are implicit, namely the psychological factors of users. KE is used to complement product development techniques based on these parameters. How to translate psychological factors into the characteristics of a product, thus creating a new product.

The purpose of this analysis is to explain the general description of KE procedures in product development, not just industrial products, but can be applied in other areas of human computer interaction through the software interface. The KE technique used is Kansei Engineering Type I (KEPack).

Kansei Engineering

According to Japanese dictionary, Kansei (感性) means sensitivity (Shiang, 2013). Kansei is defined as a person's subjective impression of the surroundings caught by the five senses (Schutte, 2005). Kansei involves sensitivity, sensibility, feelings and emotions harmonized through the five senses; vision, hearing, smell, feeling, skin sensation (Lokman and Nagamachi, 2010). The term Kansei is then translated in an engineering method called Kansei Engineering. This method was first introduced by Mitsuo Nagamachi (Dean of Hiroshima International University) as a new engineering methodology in the design and development of industrial products that are psychologically oriented to human factors.

Kansei Engineering is a technology that combines Kansei into the world of engineering in realizing products that suit the needs and desires of consumers. Or in other words Kansei Engineering is a technology in the field of customer-oriented ergonomics for product development (Lokman and Noor, 2006). Until now Kansei Engineering has been developed in several analytical techniques, namely:

a. Kansei Engineering Type I (KEPack)
b. Category Classification
c. Kansei Engineering System
d. Kansei Engineering Hybrid
e. Kansei Collaborative Designing
f. Virtual Kansei Engineering

Kansei Engineering Products

Kansei product is a product produced through qualitative and quantitative approach in the implementation of KE. A successful Kansei product, resulting from a combination of Kansei engineering implementation in outlining the design requirement recommendations with the skills and experience of product designers. Some of Kansei's successful products in the industrial market include Interior Design Boeing 7E7 (Guerin, 2004), Mazda Miata (Nagamachi, 1999), Deesse Shampoo and Treatment, Brassiere Good-Up Bra (Nagamachi, 2011). In addition to successful products in the industry, some researchers have developed Kansei products in academic research, including Kopi Kalengan (Ishihara, 1997), ecommerce web design (Lokman, and Nagamachi, 2009).

Kansei Engineering Type 1

Kansei Engineering Type 1 is Kansei's most popular technique, named with KEPack (Lokman, 2010):

> *"KEPack is formulated as company's product development strategy focuses on design domain as well as the target users (costumers). It involves the compilation of Kansei Words relating to product domain"*

The whole plot of KEPack is shown in Figure 2:

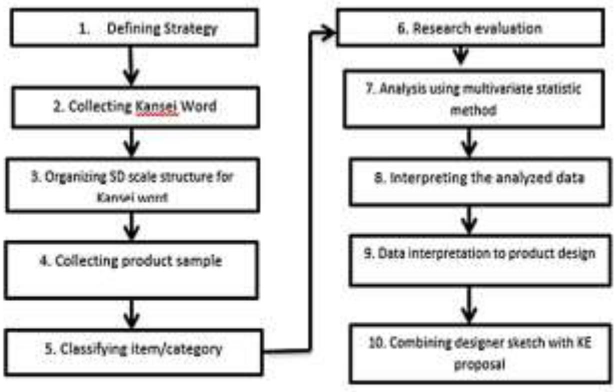

Figure 2. *Kansei Engineering* plot with *KEPack*

Kansei Engineering Implementation

a. Research Initiation
It is an early stage in this process, in which the materials and research objects are determined. In this analysis as many as 20 Kansei Word and 10 specimens were involved, as well as the steps used referring to KEPack.

b. Collecting and Defining Kansei Word (KW), which is then used for questionnaires for participants in the form of adjectives or nouns. The determination of KW becomes the basis for the next stage. KW is obtained by means of several references such as dictionaries, magazines, related literature, expert opinions or comments from the general public or community and then associated with the object under study. In this analysis KW is derived from books / magazines / journals related to the interface of software, subjective thinking, expert opinions and teachers. Until finally determined as much as 20 KW which is in table 1.

Table 1. *Kansei Word* Used in Research

No	*Kansei Word*	No	*Kansei Word*	No	*Kansei Word*
1	DINAMIC	8	FEMINIM	15	PASSIONATE
2	*FUTURISTIC*	9	NATURAL	16	*CHILDISH*
3	INFORMATIVE	10	MATCH	17	*COLORFUL*
4	SOFT	11	COMFORTABLE	18	FORMAL
5	SIMPLE	12	RIGID	19	SWEET
6	SHARP	13	COMPLEX	20	LUXURIOUS
7	BRIGHT	14	UNIQUE		

Volume 01, Number 01, February 2018
p-ISSN: 2615-3769 ; e-ISSN: 2615-3750

c. Translating Kansei Word into the SD Scale Structure
In preparing the scale of Semantic Differential (SD) generally use 2 different words such as "Attractive Views .... Boring Views" with the scale between 5, 7, 9 and 11. But in KE there is little difference, with the addition of the word "no" to the meaning of the verbal word, such as "Attractive Display .... The Display Is Not Interesting" and the scale used using 5 scales to make it easier for participants to fill in the questionnaire. KW in table 1 then made an SD scale with some modifications such as a brief explanation of each KW, shown in Figure 3:

f. Process of Quantifying Questionnaire Data from Participants
A total of 20 - 30 people are sufficient to be subjected to Kansei research (Nagamachi, 2003). 10 valid specimens in the form of a software interface display were assigned to the participants with a finely-structured Kansei Word sheet of the SD scale to become a filling material. Ideally the questionnaire filling pattern is limited by the time span, 2-3 seconds each charging per Kansei Word item. So in one questionnaire it takes ± 1 minute. When calculated entirely, filling the questionnaire takes 20-30 minutes.

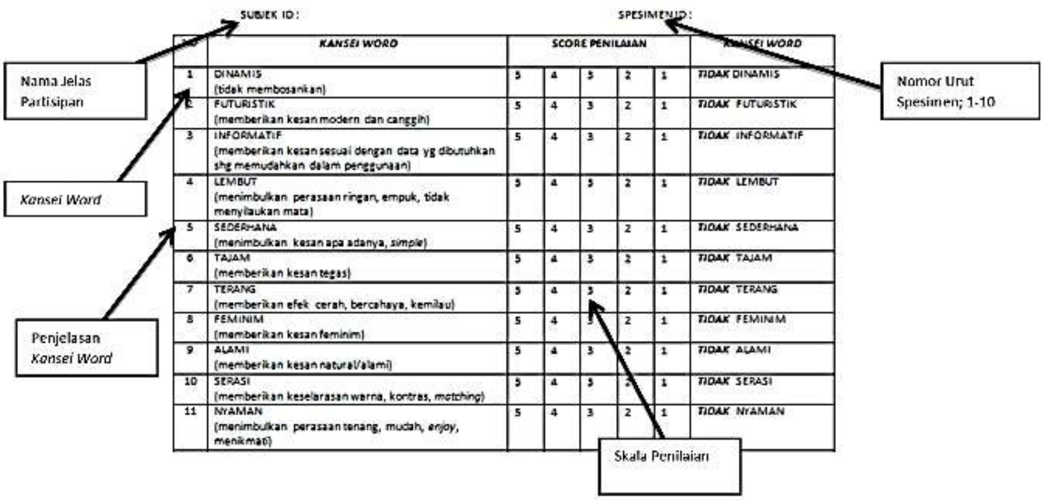

Figure 3. Sheet of Questionnaire with SD Scale

d. Collecting and Specifying Specimen of the software interface.
Some of several specimens proposed, 10 valid specimens in the form of software interface display are generated with different characteristics and uniqueness of the selection by involving experts.

e. Classify the interface of the software interface
The next step is to classify the 10 specimens by category of design elements. Generally there are 6 main categories in the design elements, namely Header, Top Menu, Left Menu, Main Menu, Right Menu and Footer. Classification by matrix simplifies this stage, as shown in table 2:

Tabel 2. Sample of Specimen Classification by Design Element

NO SPESIMEN	WARNA BACKGROUND				HEADER								
					ADA	HURUF					UKURAN		
	PUTIH	UNGU	ABU-ABU	BIRU		SERIF	SANSSERIF	CURSIVE	FANTASY	MONOSPACE	SMALL	MEDIUM	LARGE
1	√	-	-	-	-	√	-	-	-	-	-	√	-
2	-	√	-	-	-	-	√	-	-	-	-	√	-
3	-	-	-	√		-	-	√	-	-	-	√	-
4	-	-	√	-	√	-	-	√	-	-	√	-	-
5	√	-	-	-	√	-	-	-	-	√	-	√	-
...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	-	-	√	-	-	-	-	-	√	-	-	-	√

The data capture pattern is shown in Figure 4.1, with an LCD as Display Screenshot. Operator is a person who operates of computers and participants. Data are then reconfigured and averaged manually to be processed in the multivariate statistical analysis stage.

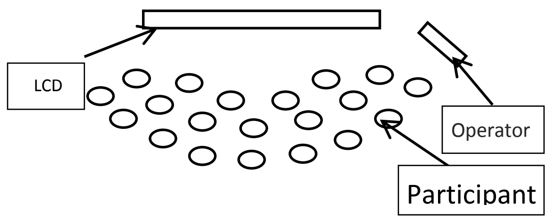

Figure 4. Data Collection Patterns of Participant

g. Multivariate Statistics Analysis
The average data that has been produced in the previous stages is then analyzed using multivariate statistical analysis. The statistical analysis that will be done is as in table 3

Volume 01, Number 01, February 2018
p-ISSN: 2615-3769 ; e-ISSN: 2615-3750

Table 3. Multivariate Statistical Analysis

No.	Method	Goals	Result
1	*Coeffision Correlation Analysis (CCA)*	Knowing the relationship between each emotion (KW)	The concept of emotional psychological factors
2	*PC Analysis (PCA)*	Identify the emotional relationship (KW) with the specimen	
3	*Factor Analysis (FA)*	Identify emotional factors (KW) that affect the specimen	
4	*Partial Least Square Analysis (PLS)*	Translating emotions (KW) into design elements (Performed in Stage h)	The design requirements for developing a software interface match the psychological / emotional goals
5	*Cluster Analysis (CA)*	Grouping the same emotions with others (Performed on Stage h)	

PCA was performed to determine the relationship between specimens and psychological factors by reducing the psychological factors that are not very significant, resulting in two factors that have a predominant percentage value, called F1 and F2. PCA analysis can use XLStat 2010 software tools involving recapitulation data of average participants as data analysis materials.

Three stages of PCA analysis are calculated to analyze F1 and F2 in illustrating the relationship of psychological factors and specimens, namely:

1) PC Loading, which in this analysis is used to know the distribution of psychological factors so that it can be concluded the psychological concepts that influence in the specimen
2) PC Score, to know the relationship between psychological and specimen
3) PC Vector, to find out how much psychological influence with the specimen, also determine the Kansei area in the proposed design interface design software interface

In order to elaborate and strengthen the results of PCA, a follow-up analysis of Factor Analysis (FA) using XLStat 2010 software is required. The average recapitulation data is used as an FA analysis material using varimax rotation to obtain more accurate values.

h. Translating Statistical Data into Design Elements

This stage is still related to the previous stage, the calculation of statistical analysis of Partial Least Square Analysis (PLS) and Cluster Analysis (CA) is used to interpret statistical data into design elements.

PLS Analysis translates the relationship effects between psychological factors with design elements is as to produce recommendations of design elements in accordance with psychological factors based on the psychological concepts generated on PCA analysis. PLS analysis using XLStat 2010 software tools. The data involved in PLS analysis are:

1) Variable y (Dependent) in the form of recapitulation of the average questionnaire from the participants
2) Variable x (Independent) in the form of design elements that are translated into dummy variables.
3) 10 Specimen display interface software

Before the next stage, the design element category (in point e) is translated into the dummy variable by changing the tick mark given the value 1 and the blank column given the value 0, as in table 4:

Table 3. The tick mark given the value 1 and the blank column given the value 0

ID SPECIMEN	BodyBGCol DarkBlue	BodyBGCol Blue	BodyBGCol White	BodyBGCol Gray	BodyBGCol Green	BodyBGCol Maroon	BGStyle Solid
1	1	0	0	0	0	0	0
2	0	0	1	0	0	0	1
3	0	0	1	0	0	0	1
4	0	0	0	1	0	0	0
5	0	0	0	0	1	0	1
6	0	0	0	1	0	0	1
7	0	1	0	0	0	0	1
8	0	0	0	1	0	0	0
9	0	0	0	0	0	1	0
10	0	0	1	0	0	0	1

i. Creating a Matrix of Kansei Engineering Analysis Results

As the final step after the statistical analysis is made a matrix based on the results of analysis PLS and Cluster Analysis combined with the classification of design elements (in point e), the results displayed contain design proposal criteria in the form of Design Guidance Matrices.

IV. CONCLUSION

Kansei Engineering, which is generally used in the development of industrial products, can be implemented in product design related to the world of informatics, Human Computer Interaction. This analysis answers how the Kansei Engineering procedure in general provides recommendations on the design of the interface through one Kansei Engineering technique, namely Kansei Engineering Type 1. The final result is a design proposal matrix, based on psychological factors translated through multivariate statistical analysis.

REFERENCES

Akao, Y. 1990. *Quality Function Deployment*. Productivity Press, Cambridge MA

Volume 01, Number 01, February 2018
p-ISSN: 2615-3769 ; e-ISSN: 2615-3750

Curry, J. 1996. *Quirk's Marketing Research Review*. Sawtooth Software

Guerin, J. 2004. *Kansei Engineering for Commercial Airplane Interior Architecture. The sixteenth Symposium on Quality Function Deployment.* 19-26

Ishihara, S. Ishihara, K. Tsuchiya, T. Nagamachi, M. Matsubara, Y. 1997. *Neural Networks Approach to Kansei Analysis of Canned Coffee. Proceedings of 13th Triennial Congress of The International*

Lokman, A.M., Nagamachi, M. 2009. *Validation of Kansei Engineering Adoption in E-Commerce Web Design.* Kansei Engineering Int'l Vol. 9 No. 1.

Lokman, A.M. 2010. *Design & Emotion: The Kansei Engineering Methodology*. University Technology Mara (UiTM). Malaysia

Lokman, A.M., Nagamachi, M., 2010. *Kansei Engineering* - A Beginner Perspective. 1st Edition, Selangor, Malaysia: UPENA, UiTM.,

Lokman, A.M. Noor, L.M. 2006. *Kansei Engineering Concept in* E-Commerce Website. Proceeding of the 3rd Int'l Conference on Kansei Engineering and Intelligent System, pp: 118., [Online] Available: www.anitawati.uitm.edu.my

Shiang, Tjhin Thian. 2013*Kamus Lengkap Jepang Indonesia.* Jakarta: GAKUSHUDO.

S. Schutte. 2005. *Kansei Engineering in Development*, A Dissertation, pg: 38. [Online] Available: www.ep.liu.se

Nagamachi, M. 1999. *Kansei engineering: A new consumer-oriented technology for product development. In W. Karwowski and W.S. Marras (Eds). The occupational ergonomics. Chapter 102, 1835-1848*

Nagamachi, M. 2003. *The Story of Kansei Engineering.* Tokyo: *Japanese Standards Association, 6..*

Nagamachi, M. 2011. *Kansei/Affective Engineering*. USA: Taylor & Francis *Group. Ergonomics Association. Vol. 2, 211-213*