# APPLICATION OF THE KANSEI ENGINEERING METHOD IN THE DEVELOPMENT OF E-LEARNING SCHOOL OF HARUM SENTOSA BARU'S FOUNDATION

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## ABSTRACT:

E-learning applications are now widely available on various platforms, both paid and free. However, the school needs a private e-learning application that can be managed and customized by the school and of course requires features according to school needs. Several institutions have developed E-Learning. However, most of them only focus on the developer's perspective without considering what kind of E-Learning the learner really wants. Preferably, E-Learning products should not only focus on the technical part such as convenience, advantages or other features, but the point is how to psychologically entice users to use the product. To create an e-learning website that is user-friendly and has a high level of usability, a software development method is needed, one of which is the Kansei Engineering method. This research resulted in several emotional factors that must be considered in designing e-learning displays. The research proves that there is a relationship between the interface and the user's feelings, the relationship between Kansei words which affects the appearance of the desired interface. The three methods of multivariate analysis are like CCA proved to be an effective method for determining relationship between Kansei words. FA effectively determines the power of Kansei's words to e-learning interface so it can be determined which Kansei words to consider in choosing and implementing e-learning, especially using open source LMS for schools. The results show that the user's emotional factor influence behavior, while the most influential only one, namely "modern." The Kansei word "modern" has a very strong relationship with two Kansei words like "Interesting" and "Informative". The concept of Kansei words can be used to build applications according to the user's feelings. However, aspects of ease of access, effectiveness, and not loading for a long time are also things that must be considered. Although not all kansei word design principles are accommodated, interaction design elements are able to produce application designs that have good usability. In addition, determining the type and size of the font also considers legibility by the human eye. In terms of coloring, the use of a gray background color and a blue top menu color is expected give the impression of modern, interesting and informative for user. Expected, the use of color the right one can make it easier for the user identify the information contained inside it. Even though the aesthetic appearance has a modern impression, Information that presented along with the flow of information made with a simple systematic. Besides that, some of the terms used on this application adapted to the reality in real life. It makes it easy the user understands the intent of the application.

**Keywords:** *E-learning, Emotional, Kansei Word, User Interface*

# 1. INTRODUCTION

World development that aims for global human welfare or better known as the Sustainable Development Goals (SDGs) is an agenda that must be resolved. Technological developments participate in completing the 17 goals of the SDGs such as health [1][2][3], supporting sustainability and ending hunger [4][5]. Another SDGs goal that needs attention is quality education. Quality education is important for the economic evolution and social development of a country [6].

E-Learning or Electronic Learning has become a popular term in recent decades. E-Learning is an electronic-based learning process using a computer network or the internet as a learning medium [7]. As a result of the increasing surge in Covid-19 in 2020, educational institutions such as campuses and schools must change the learning process to be online or asynchronous. However, online learning certainly requires facilities in the form of connecting media between teachers. In general, e-learning can be accessed by teachers to provide material, assignments, exams/quiz, grades, etc. and students can receive material, assignments and exams/quiz and others [8]. The application of e-Learning can be seen as an aspect of competitive advantage, which is able to offer various solutions to improve the quality of educational outcomes, not only as a means of the teaching and learning process but also has a function as forming the characteristics of the teaching and learning process [9].

E-learning applications are now widely available on various platforms, both paid and free. The large number of e-learning applications has resulted in teachers using various online platforms so that it is not uncommon for students to have to study various platforms in learning [10][11][12]. However, the school needs a private e-learning application that can be managed and customized by the school and of course requires features according to school needs. Several schools and universities have developed E-Learning [13][14][15][16].

The application of e-learning in the world of education is currently the main thing and requires evaluation in its use. Evaluation is carried out to find out and measure how much effectiveness, efficiency and user satisfaction is on the quality of the learning process as a whole by using the auto model method [17]. Exploring the critical challenges faced by e-learning systems and covering the main factors that support the use of e-learning systems has been carried out with the results of technology factors, e-learning system quality factors, cultural aspects, self-efficacy factors and trust factors being the factors critical in developing e-learning [18]. Analytical Hierarchical Processing (AHP) has been used to create a more flexible framework for users to customize their e-learning environment. [19]. Good e-learning is e-learning that can improve the abilities of users who use it. Interface design is one of the most important elements that can support the quality of education in cyberspace. Evaluation of the interface design of an e-learning based website is carried out using human factors and an ergonomic interpretation approach, to improve the usability and usability of a system [20] [21]. Secondary factors such as user experience (useful, desirable, accessible, usable) as well as emotions related to user profiles also affect open distance learning (ODL) school students [22]

If most e-learning developments only focus on the developer's perspective, consider e-learning as what users really want. Then an evaluation is carried out after e-learning has been developed. It will result in wasted work. However, most of them only focus on the developer's perspective without considering what kind of E-Learning the learner really wants. Preferably, E-Learning products should not only focus on the technical part such as convenience, advantages or other features, but the point is how to psychologically entice users to use the product. To create an e-learning website that is user-friendly and has a high level of usability, a software development method is needed, one of which is the Kansei Engineering method.

The Kansei Engineering method basically gives user demands on a software product development to a psychological or emotional factor approach concept [23][24]. Users can explore the types of emotions in designing the display design parameters of the software [25][26]. Teachers like teachers are users, playing an important role in determining the design of e-Learning systems. It is very important to incorporate the emotional requirements of the users into e-Learning software development [27]. The user interface is an important software component that acts as a bridge to facilitate interaction between the user and the system. By using the kansei method, user interface design must consider the user's emotions to create a positive experience while running a software system. Kansei engineering can analyze the user's

feelings towards the software interface [28]. The kansei approach can produce recommendations to obtain taste values from users involving psychological factors and tastes [29].

Design that evokes user emotion is one of the main problems in developing e-learning. Emotional design can attract users by creating a different feeling using the application. Moodle has developed an opensource e-learning application. However, the applications developed by Moodle are only based on functional aspects. Not being able to meet user needs caused by poor design of web learning applications so that they do not suit user needs, for example not user friendly, unreliable and unclear processes.

Several studies have analyzed students' emotional experiences as e-Learning users in tertiary institutions, and then determined which opensource e-Learning systems matched their positive emotional experiences [30][31]. E-learning users are not only students but also teachers. The emotional experience of educators using applications is important because educators have a fairly important role in the success of the online learning process. Educators become the driving force in the teaching and learning process [32]. Indonesian remote school teachers mostly have inadequate skills in implementing e-learning [33]

The purpose of this study is to implement Kansei engineering with correlation coefficient analysis to analyze and explore the emotional experiences of users at the Yayasan Harum Sentosa Baru. The age factor and limited knowledge of technology make it difficult for educators at the Yayasan Harum Sentosa Baru to use e-learning applications. The difficulties experienced because the design is not user friendly makes educators not interested in using e-learning applications. So that research will be carried out to identify emotional factors related to the appearance of the e-Learning interface based on the experience of the Educator's teaching and learning process. This study attempts to explore e-Learning based on its emotional aspects by finding a relationship between the user interface (educator) and the emotional experience of educators in e-Learning. So that educators can become a driving force for students in using e-learning applications at the Yayasan Harum Sentosa Baru.

## 2. PROPOSED METHODOLOGY

The framework in this study uses Kansei Engineering Type I which is the most popular Kansei technique and is very suitable for e-learning development. The stages for conducting this research can be seen in Figure 1 below:
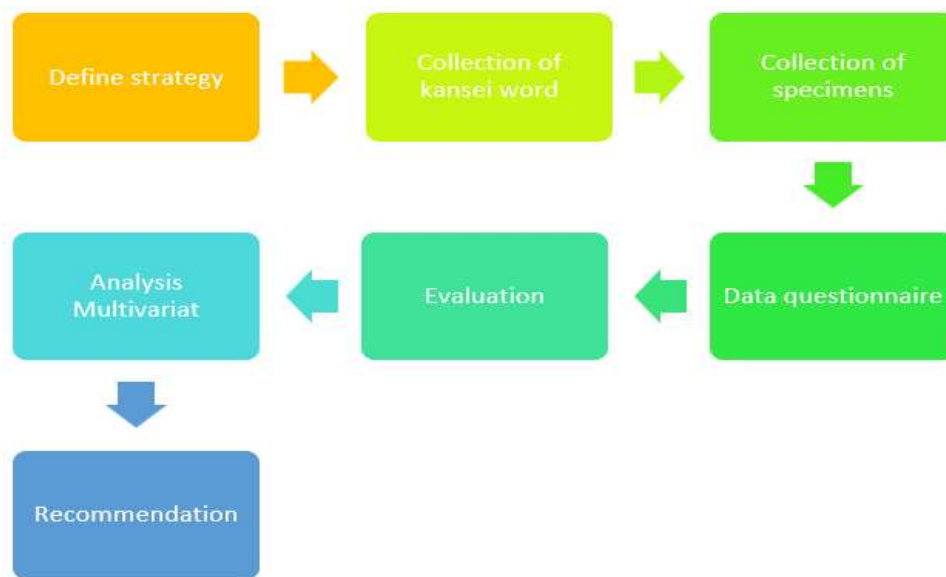


*Fig 1. Proposed Methodology*

a. Collection of specimens

The steps taken in this study collect adjectives as Kansei words that have a relationship with e-learning applications. All adjectives were obtained from related literature and user interviews. Then divide the Kansei words into several categories according to similarities in meaning or opposite meanings. If there are kansei words that have something in common then choose only one kansei word. The final step determines the Kansei word that will be used for the data questionnaire. There are 20 kansei words used in this study which can be seen in the table below:

*Table 1 List Of Kaisei Words*

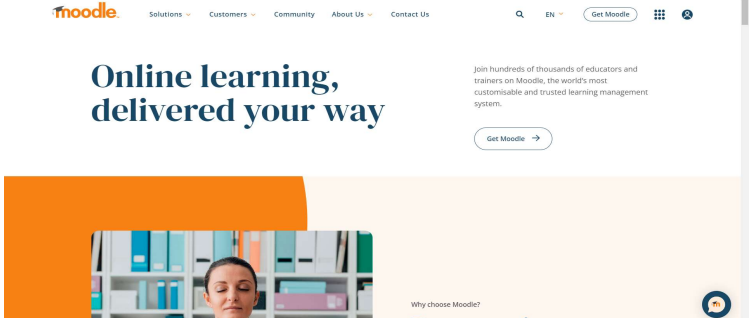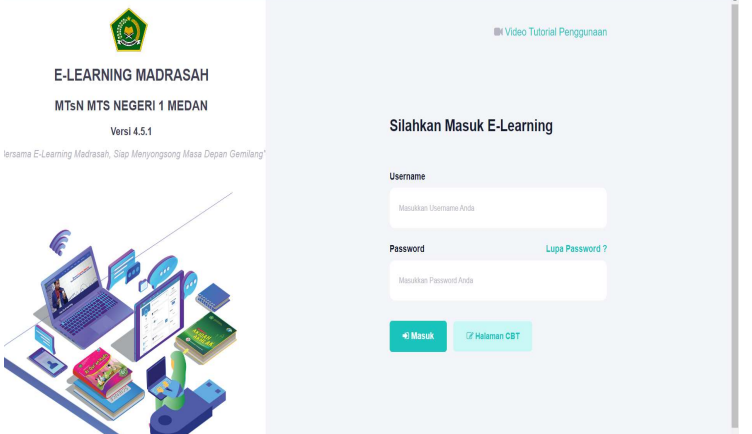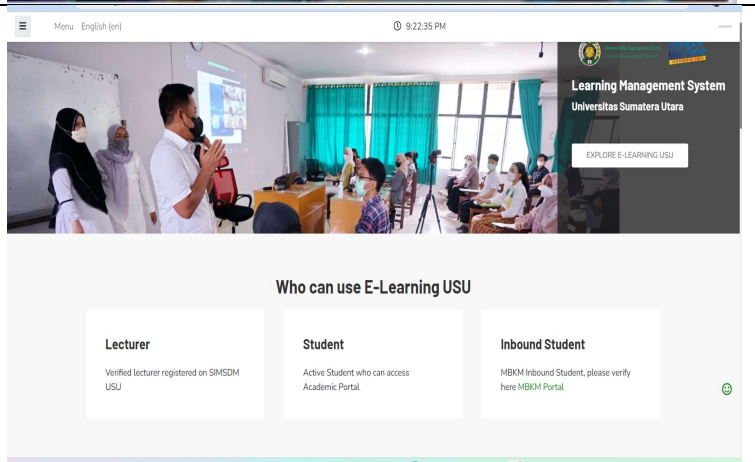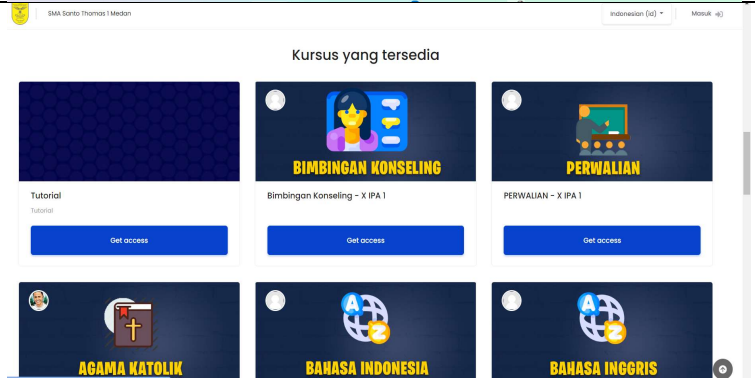| No | Kansei word | No | Kansei word |
|----|-------------|----|-------------|
| 1 | Understandable | 11 | Colorful |
| 2 | Easy to learn | 12 | Gentle |
| 3 | Simple | 13 | Match |
| 4 | Fast | 14 | Elegant |
| 5 | Organized | 15 | Unique |
| 6 | Safe | 16 | Dynamic |
| 7 | Beneficial | 17 | Experience |
| 8 | Interesting | 18 | Fun |
| 9 | Modern | 19 | Graceful |
| 10 | Informative | 20 | Creative |

b. Collection of specimens

Specimen candidates were obtained from search results using the Google search engine with the search keywords "E-learning website". There are 10 candidate specimens, for display specimens selected display differences and which can be opened using a browser on the desktop. Then it will filter candidate specimens that have similarities but have different design element characteristics. Of the 10 candidates, 5 elearning specimens were selected which can be seen in the table below:

Table 2 Elearning Specimens

| No | E-learning | Address Website | Website View |
|----|-----------|-----------------|--------------|
| 1 | Moodle | https://moodle.com/ |  |
| 2 | MAN 1 Medan | http://elearning.emsen1medan.sch.id/ |  |

| 3 | Edmodo | https://www.edmodo.com |  |
| 4 | Universitas Sumatera Utara | https://elearning2.usu.ac.id/ |  |
| 5 | SMA Santo Thomas 1 Medan | https://elearning.smasantothomas1.sch.id/ |  |

c. Collection of Questionnaire Result Data

The twenty kansei words along with five e-learning web specimens were then formulated in the form of a questionnaire. Respondents filled in data into kansei word sheets that had been structured into an SD (Semantic Differential) scale. Table 3 is the data from the questionnaire then recapitulated and averaged manually using Microsoft Excel.

*Table 3 Average Participant Recapitulation Results*

| No | Spesimen ID | Average | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Interesting | 3.75 | 3.75 | 2.80 | 3.75 | 3.75 |
| 2 | Modern | 3.77 | 3.77 | 2.30 | 3.77 | 3.77 |
| 3 | Informative | 2.20 | 2.43 | 3.67 | 3.73 | 3.80 |
| 4 | Colorful | 2.80 | 2.56 | 3.70 | 2.20 | 2.10 |
| 5 | Gentle | 2.30 | 2.17 | 2.56 | 3.30 | 3.68 |
| 6 | Match | 3.67 | 3.13 | 2.89 | 2.67 | 2.17 |

| 7 | Elegant | 3.81 | 3.20 | 2.45 | 2.20 | 2.26 |
| 8 | Unique | 2.36 | 2.18 | 3.36 | 3.36 | 3.56 |
| 9 | Dynamic | 3.82 | 3.72 | 3.12 | 2.42 | 2.82 |
| … | ... | … | … | … | … | … |
| 19 | Graceful | 2.85 | 2.85 | 2.30 | 3.45 | 3.15 |
| 20 | Creative | 2.56 | 2.14 | 2.23 | 3.56 | 3.86 |

| Creative | 0.86 | 0.64 | 0.73 | 0.26 | 0.31 | … |
|---|---|---|---|---|---|---|

Then perform Cronbach's Alpha before performing multivariate statistical analysis calculations. Cronbach's Alpha analysis is useful for measuring the level of reliability of the data. Based on the data in the table, the Cronbach's Alpha value is 0.835. Because the value obtained is greater than 0.7, the questionnaire is valid so that it can be analyzed further in the calculation of multivariate analysis.

## 3. RESULT AND DISCUSSION

### a. Multivariate Analysis

This study involved 5 specimens, 20 participants and 20 Kansei Words to produce average data which were analyzed using multivariate statistical methods. multivariate statistical analysis aims to obtain an overview of the kansei word concept for the E-Learning specimens to be developed. The multivariate statistical analysis techniques performed were Coefficient Correlation Analysis (CCA), Principal Component Analysis (PCA) and Factor Analysis (FA). CCA is carried out with the aim of knowing the correlation and measuring the strength of the relationship between each Kansei word. The results of the CCA analysis for all participants are shown in table 4.

*Table 4 Results of CCA Analysis of All Participants*

| Variables | Interesting | Modern | Informative | Colorful | Gentle | … |
|---|---|---|---|---|---|---|
| Interesting | 1 | 0.77 | 0.65 | 0.23 | 0.37 | … |
| Modern | 0.77 | 1 | 0.83 | 0.56 | 0.37 | … |
| Informative | 0.65 | 0.83 | 1 | 0.40 | 0.56 | … |
| Colorful | 0.23 | 0.56 | 0.40 | 1 | 0.37 | … |
| Gentle | 0.37 | 0.37 | 0.56 | 0.37 | 1 | … |
| ... | … | … | … | … | … | … |
| Graceful | 0.35 | 0.25 | 0.43 | 0.45 | 0.15 | … |

Based on table 4 of the results of the CCA analysis of all participants, it is known that the emotional correlation between Kansei Words has two relationships, namely a strong relationship and a weak relationship. A strong relationship is marked by a higher value than the other Kansei Word values. Meanwhile, a weak relationship is characterized by a negative value and has a value close to 0 (<0.3)

### b. Kansei Words' Relationship

Then look for the relationship between the specimens with the kansei word using the PCA method. PCA looks for this relationship by reducing the research data variables, namely kansei words and specimens which are not too significant without reducing the characteristics of the data. The positive values contained in the variables are used as a reference for recommendations in making E-learning web display designs.

The PCA multivariate statistical analysis technique was processed by involving the average participant recapitulation data as material for data analysis. After calculating the PCA analysis, several factors or also called the Principal Component (PC) are produced which are shown in Table 5.

*Table 5 Results of PC Value of All Participants*

|  | PC1 | PC2 | PC3 | …. | PC9 |
|---|---|---|---|---|---|
| Eigenvalue | 14.27 | 4.81 | 2.14 | … | 0.12 |
| Variability (100) | 67.65 | 17.43 | 7.76 | … | 0.58 |
| Cumulative (100) | 67.65 | 83.08 | 87.03 | … | 100 |

Based on the table above, it is known that the PCA statistical method can compress 20 kansei words to the number two or three axes that are smaller than the resulting I factor which is called the Principal Component (PC). Then the kansei word structure can be determined by analysis. Table 5 shows the eigenvalue scores or variance and variability for each PC1 to PC9. The eigenvalue scores of PC1 and PC2 were 14.27 and 4.81 respectively with a variability level of 67.65% and 17.43%. The cumulative lines PC1

and PC2 show 83.08% of the total variance. It means PC1 and PC2 has represented the data analysis and has an influence on the kansei word. While PC3 to PC9 have lower eigenvalue scores and the percentage of variability is not significant,

because PC1 and PC2 have represented more than 80% of the total variance, so PC3 to PC9 can be ignored and focus on PC1 and PC2 for further analysis.
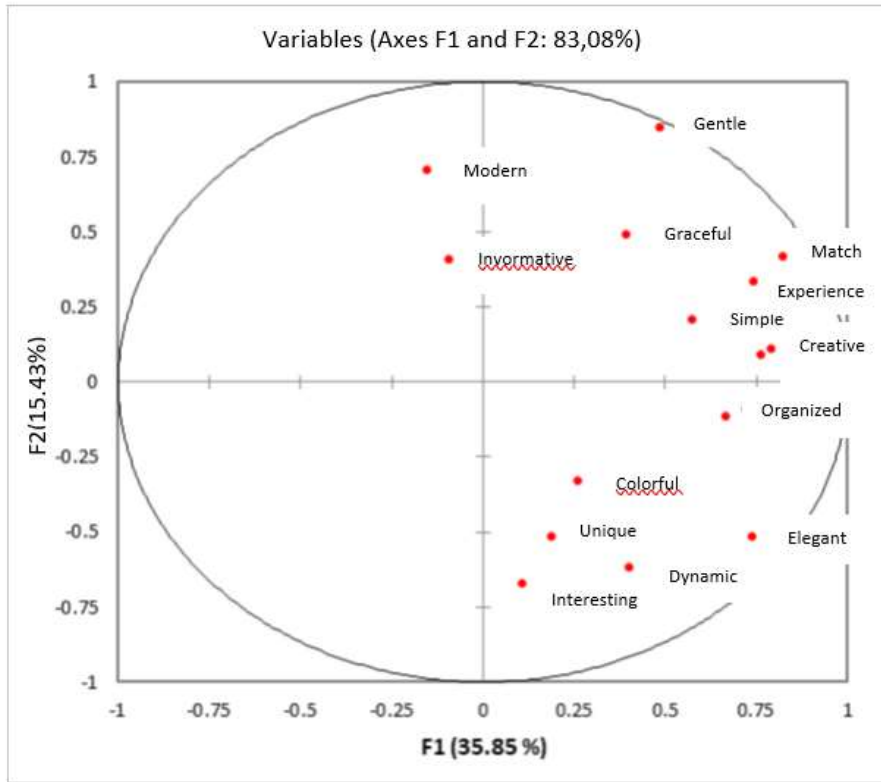


*Fig 2 PC Loading Results F1 And F2.*

The image above is the result of PC Loading F1 and F2. The red dots show the distribution of the Kansei Word concept to the specimens. Then do factor analysis to get Kansei word distribution, as shown in Fig. 2. The

The distribution is divided into 4 quadrants. Where quadrants I and II show the Kansei areas that have strong kansei words, especially quadrant I. Based on Fig. 2 it is known which Words of Kansei have the strongest influence on the specimen.

Based on the quadrants, it is known that only one emotional factor has the most influence, namely "modern". The Kansei word "modern" has a very strong relationship with two Kansei words like "Interesting" and "Informative".

In accordance with the results of the kansei words, then the application design recommendations are given as follows:

a. Background body html is recommended to use gray. As for the body font, it is recommended to use black with a medium size.

b. The top menu is at the top of the website page with a blue background color and the recommended font color is white.

c. Headers and footers are recommended to use the Arial font type with black color.

The concept of Kansei words can be used to build applications according to the user's feelings. However, aspects of ease of access, effectiveness, and not loading for a long time are also things that must be considered. Although not all kansei word design principles are accommodated, interaction design elements are able to produce application designs that have good usability. In addition, determining the type and size of the font also considers legibility by the human eye.

In terms of coloring, the use of a gray background color and a blue top menu color is expected

give the impression of modern, interesting and informative for user. Expected, the use of color the right one can make it easier for the user identify the information contained inside it. Even though the aesthetic appearance has a modern impression, Information that presented along with the flow of information made with a simple systematic. Besides that,

some of the terms used on this application adapted to the reality in real life. It makes it easy the user understands the intent of the application.

## 4. CONCLUSION

The user interface is an important part of e-learning, so it must be designed as well as possible. Interface design is very good if it involves users to build the right look. Using the Kansei technique can help software developers to design interfaces with taking into account the user's emotional factors. This research resulted in several emotional factors that must be considered in designing e-learning displays. The interface appearance will greatly determine the user experience. The higher the level of emotional connection between the user and the e-learning information system software can increase the lifespan of the e-learning information system software. The research proves that there is a relationship between the interface and the user's feelings, the relationship between Kansei words which affects the appearance of the desired interface. The three methods of multivariate analysis are like CCA proved to be an effective method for determining relationship between Kansei words. FA effectively determines the power of Kansei's words to e-learning interface so it can be determined which Kansei words to consider in choosing and implementing e-learning, especially using open source LMS for schools.

The interface appearance will greatly determine the user experience. The higher the level of emotional connection between the user and the e-learning information system software can increase the lifespan of the e-learning information system software. The results show that the user's emotional factor influence behavior, while the most influential only one, namely "modern." The Kansei word "modern" has a very strong relationship with two Kansei words like "Interesting" and "Informative".

The addition of this e-learning research should also be on students' emotional feelings. Emotional feelings of students are also needed to translate into the basic structure of the design elements that describe the display interface model for e-learning using based on user feelings. This is because users of e-learning applications are students and educators. Collecting questionnaire data for two users also requires more time and the number of Kansei words used will also be wider. The level of student participants from elementary, middle and high school levels will certainly give different results. In addition, for further research other factors can also be explored using methods such as AHP, TOPSIS and other different analytical methods.

Furthermore, it is also necessary to test the interface that has been developed using engineering Kansei. Is it able to provide comfort and convenience according to the concept of the learner's emotions. Requesting feedback through questionnaires from users can be done to test usability on aspects of effectiveness, efficiency and satisfaction aspects.

## 5. ACKNOWLEDGMENTS

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