

The Study of E-Learning User Interface Analysis Based on Emotional Perceptions Using Kansei

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ABSTRACT

Kansei words are adjectives or sentences which shows the emotion of respondents regarding the appearance of application user interface. So it have important role of Kansei Engineering in order to what kind of emotions to be considered and implemented during developing an application user interface. Without considering user's emotions it would be difficult to develop an suitable application user interface that fullfills user's emotional requirements. In this study we proposed a Kansei Engineering to explore Kansei Words related to user interface and analysis the relationship between them. We used eight Kansei Words, and we found there are one strong relationship between Kansei Words of "simple" and "clear". It means that we can consider these two Kansei Words as alternative emotions in order to develop an application user interface. This paper focuses the discussion about the relationship between Kansei Words and user interface of the most popular of open-source E-Learning system.

Keywords: Kansei Engineering, User's Emotion, User Interface, Relationship, Emotional Analysis, Open-source E-Learning

I. INTRODUCTION

In today's era E-Learning is one of the most popular applications to support the learning process, especially during the current Covid-19 pandemic. In this situation, distance learning using E-Learning are more beneficial [1]. One of the most essential E-Learning component is the User Interface which acts as a bridge between the user and the internal E-Learning system.

In this study, an assessment of popular E-Learning applications based on open-source such as Moodle, A-

Tutor, etc. was conducted. The study was conducted using Kansei Engineering where E-Learning was assessed based on the user's emotional perspective, because it was the user who interacted the most with E-Learning, so that it could determine the age of the E-Learning itself. Open-source E-Learning software is used as an object in this research because it is more affordable and easier to implement compared to similar proprietary E-Learning software.

So far, Kansei has been widely used in various fields of software products or websites such as education [2],

political event [3], etc. Kansei Engineering has proven to have helped a lot to make the use of software better by improving the appearance of its user interface and also extending the life of the software.

This study discusses the influence of user emotional factors on the E-Learning interface and looks for which emotional factors have a strong influence and must be considered in designing or redesigning the E-Learning interface, so as to increase user interest in distance learning. The benefit of this research is that educational institutions can consider more careful in determining which E-Learning is the most suitable for supporting in their respective learning environments.

II. RELATED RESEARCHS

Several studies have been carried out related to the appearance of various applications that use Kansei Engineering, including the following:

1. E-Learning implementation at senior high school based on Kansei Engineering [2].
2. The study of user interface of academic information system based on Kansei [4].
3. Kansei analysis for website of university based on Kansei Engineering [5].
4. Design of E-Learning support system for high education learning activity using Kansei Engineering [6].
5. Design UI/UX of Coding Bee Academy website using Kansei Engineering [7].

These five Kansei Engineering studies above are related to online learning and learning support activities in high education institute based on E-Learning system. There are also many researchs that discuss how to apply Kansei Engineering in redesigning the application interface, especially E-Learning.

III. RESEARCH METHOD

In Kansei Engineering there are several methodologies that can be used [8]. However, in this study we used methodology of KEPack I [9][10] which is commonly applied in user interface research.

This research is limited to finding the relationship between Kansei Words and how they affect the user in assessing the appearance of the E-Learning user interface, especially using open-source software.

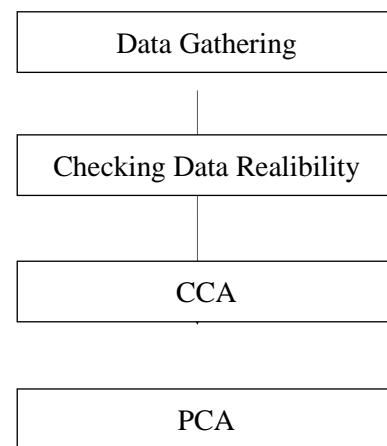


Figure 1: Research Methodology

Fig. 1 illustrates the steps of methodology conducted in our research. Especially we use CCA and PCA to explore data questionnaires and to find the relationship between the appearance of E-Learning and user's emotions. The questionnaires were gathered from 30 undergraduate students who are used to learning online for more 1 years.

We used eight Kansei Words and eight specimens of open-source E-Learning as specimens as described in the following Table I and Table II respectively.

TABLE I
E-LEARNING RELATED KANSEI WORDS

No	Adjectives
1	Clear
2	Simple
3	Spirit
4	Neat
5	Formal
6	Modern
7	Comfortable
8	Pleasant

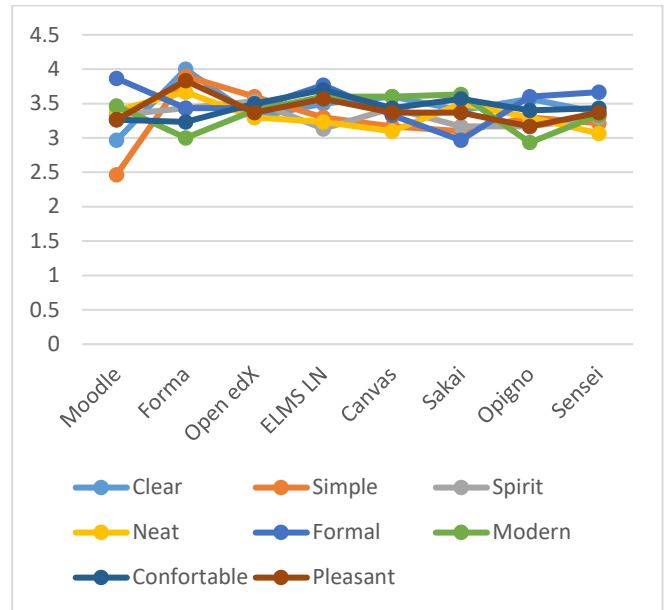


Figure 2: Research Methodology

The data illustrated in Fig. 2 is obtained from the results of the questionnaires as shown in Table III. The Kansei Word "simple" has the largest average value of 4 against E-Learning Moodle, while the Kansei Word "clear" has the smallest average value of 2,467 against E-Learning Forma. Furthermore, the data in Fig. 2 is processed using the following multivariate analysis to find critical points in designing user interface of E-Learning based on user's emotional perceptions.

TABLE III
E-LEARNING SPECIMENS

No.	Specimen
1	Moodle (https://moodle.com)
2	Forma (https://formalms.org)
3	Open edX (https://openedx.org)
4	ELMS LN (https://elmsln.org)
5	Canvas (https://www.instructure.com/en-au/canvas)
6	Sakai (https://sakailms.org)
7	Opigno (https://opigno.org)
8	Sensei (https://senseilms.org)

TABLE IIIII

THE AVERAGE DATA QUESTIONNAIRES

	Clear	Simple	Spirit	Neat	Formal	Modern	Comfortable	Pleasant
Moodle	2,9	2,4	3,3	3,4	3,8	3,4	3,2	3,2
e	7	7	3	3,4	7	7	7	7
Forma	4	3,9	3	3,6	3,4	3	3,2	3,8
Open edX	3,3	3,6	3,5	3,3	3,4	3,4	3,5	3,3
			3	3,3	3	3,4	3,5	7

The selection of all specimens is determined based on the popularity of open-source E-Learning based on the official IT'S FOSS website [11].

IV. RESULTS AND DISCUSSION

All data questionnaires from 30 undergraduate students as respondents are shown in graph as shown in Fig. 2.

ELMS			3,1	3,2	3,7			3,5
LN	3,5	3,3	3	3	7	3,6	3,7	7
Canva		3,1	3,4		3,3		3,4	3,3
s	3,6	7	3	3,1	3	3,6	3	7
Sakai			3,1		2,9	3,6	3,5	3,3
	3,4	3,1	7	3,5	7	3	7	7
Opign	3,5		3,1			2,9		3,1
o	7	3,3	7	3,3	3,6	3	3,4	7
Sensei	3,3	3,2		3,0	3,6	3,3	3,4	3,3
	7	1	3,3	7	7	3	3	7

A. Cronbach's Alpha

Before starting multivariate analysis, we have to investigate the value of cronbach' alpha to make sure the realibility of data questionnaires. The software of XLStat was used during the analysis.

After collecting all data questionnaires, first of all, we calculated the cronbach's alpha and we found it's value was 0,95 which means all data questionnaires were reliable, and can be continued the following multivariate analysis such as CCA and PCA.

B. Coefficient Correlation Analysis

This stage is to find the strength of the relationship between Kansei Words so that it can be known which Kansei Words are related to each other to get the emotional factor of alternative users. In Kansei Engineering the relationship analysis is performed using Coefficient Correlation Analysis (CCA) [12]. By knowing the strength of the relationship between Kansei Words, we can look for other kansei words as an alternative for careful consideration.

The results of the CCA are described using a heatmap to make it easier to understand as shown in Table IV. Table IV The Strength of emotional relationship between Kansei Words.

TABLE IV
KANSEI WORDS RELATIONSHIP

	Clear	Simple	Spirit	Neat	Formal	Modern	Comfortable	Pleasant
Clear								
Simple								
Spirit								
Neat								
Formal								
Modern								
Comfortable								
Pleasant								

Based on the results in Table IV, it can be clear that the strongest emotional relationship in this study is the relationship between Kansei Word "Simple" and Kansei Word "Clear". Therefore, these two Kansei Words should really be considered in developing E-Learning, especially the essential part, namely the user interface.

C. Principal Component Analysis

The next stage is Principal Component Analysis (PCA) which is an analysis to examine more deeply the relationship between the appearance of E-Learning user interface and the user emotions.

At first, we must look at how many factors should be considered in this PCA analysis. By calculating the cumulative percentage of the factors as shown in Fig. 3, we can determine how many factors must be considered in this analysis.



Figure. 3: The Eigenvalue

Table V shows the number of factors that must be considered in the PCA analysis, that is, considering 2 factors is sufficient because it has a cumulative value of more than 60%.

TABLE V: THE AVERAGE DATA QUESTIONNAIRE

	F1	F2
Eigenvalue	3,167	1,691
Variability (%)	39,592	21,135
Cumulative %	39,592	60,727

The results of PCA that illustrates the distribution of specimens and Kansei Words are shown in Fig. 4, Fig. 5 and Fig. 6.

Fig. 4 shows the distribution of user’s emotional perceptions represented by Kansei Words. The most important thing to note is the Kansei Words that are on the positive x axis. There are five Kansei Words such as “simple”, “clear”, “pleasant”, “neat”, and “spirit”. However, in this research there are three the most important Kansei Words such as “simple”, “clear” and “pleasant” because their position are on kuadran I.

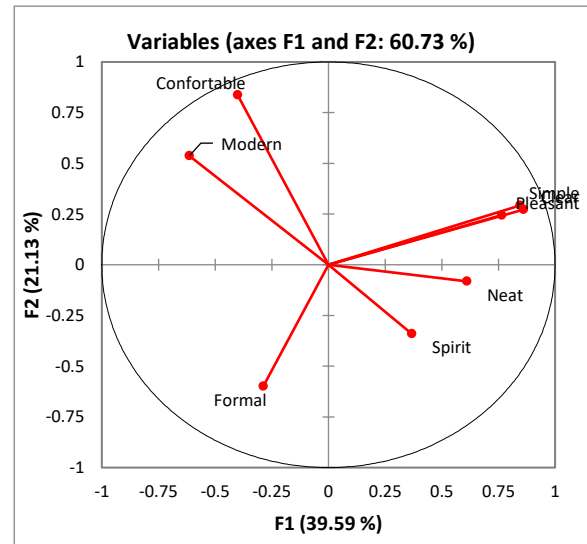


Figure 4: PC Loading

Fig. 5 shows the distribution of specimens of open source E-Learning. Three specimens of open-source E-Learning namely Open edX, Opigno, and Forma are located on the positive x axis. It means these E-Learnings have a suitable user interface according to users’ emotional requirements.

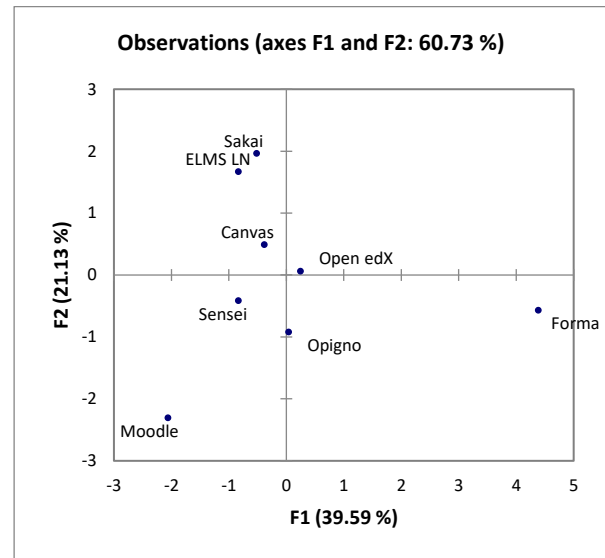


Figure 5: PC Score

Fig. 6 shows the distribution of Kansei Words and specimens. Based on Fig. 5, we find out how the Kansei Words influence the appearance of E-Learning user

interface. This can be seen from the closeness between the Kansei Words and the specimens. It shows that the closer it gets, the more it shows the effect.

According to Fig. 6 the most suitable open-source E-Learning is Forma, since the open-source E-Learning Forma is surrounded by Kansei Words of “simple”, “clear”, “pleasant”, and “neat”. It means that these four Kansei Words affected the appearance of Forma’s user interface. In other words, Forma is the user's choice because of the influence of four user's emotions, namely “simple”, “clear”, “pleasant”, and “neat”.

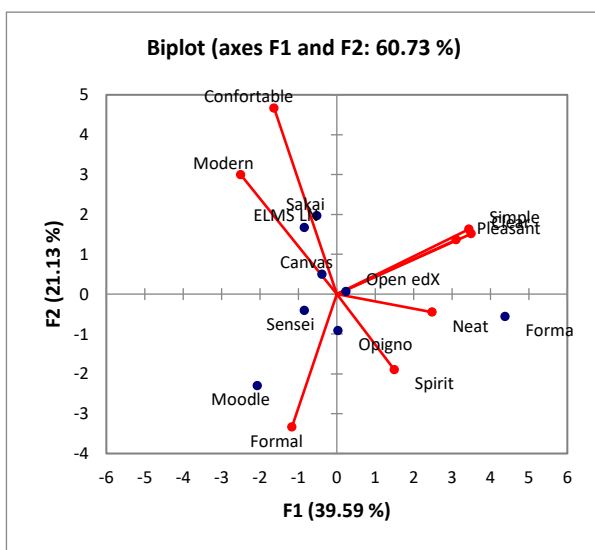


Figure 6: PC Vector

V. CONCLUSION

This study has conducted an important study of the relationship between user emotions and the appearance of E-Learning so as to determine which E-Learning selection should be implemented, which is adapted to the environment of the educational institution that implements it. This study succeeded in knowing one open-source E-Learning is the most appropriate for users, and four Kansei Words that influence users’ perspective regarding E-Learning user interface.

For further research it is important to continue the research with more specimens and users, and it is also

important to do infometrics analysis with Kansei method besides based on the content.

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