# Emotional Preferences Analysis Using Kansei in Designing The Appearance of User Interface for E-Voting Application

**Abdurrohman†, Aedah Abd Rahman†, Ana Hadiana††, Anitawati Mohd Lokman†††**

†School of Science and Technology Asia e University, Malaysia

††Research Center for Informatics – BRIN Indonesia, STMIK-LIKMI Bandung, Indonesia

†††Faculty of Computer & Mathematical Sciences – Universiti Teknologi MARA, Malaysia

**Summary**
The application of e-Voting plays an important role in order to support democracy activities in Indonesia, such as elections at different levels. E-Voting has the function of providing better service to people in order to participate in elections. This research attempts to develop the appearance of the user interface of e-Voting based on users' emotional preferences using Kansei Engineering. Kansei Engineering is used in this research to analyze emotional feelings regarding e-Voting applications' presented Kansei words and give a recommendation on the most suitable user interface to be considered in their development. This research observed two main users' emotional feelings ("calm" and "formal") selected from ten Kansei words. The final recommendation is a conceptual element designed for designing e-Voting applications based on the Kansei word "calm".

***Key words:***
*E-Voting, Kansei Engineering, Users' Preferences, Element Design, Multivariate.*

## 1. Introduction

The e-Voting application is a program application to support democratic activity, especially in Indonesia, through the internet effectively. This application in general is based on web technology, and it is possible to be connected by using a gadget such as a tablet as a media to access it over intranet or internet [1][2]. Many countries around the world are competing to implement a suitable web based e-Voting application in order to reduce election budgets and convert traditional paper-based elections into digital election.

There is an important point to be considered in development of e-Voting application. In particular, the part of the user interface that needs more attention, because this is a key part that is directly connected to users. So, we have to explore and analyze what kind of suitable user interface that users psychologically desire, because users are main players in this kind of application. The psychological aspect is one of the important thing to be considered when designing an user interface of an e-Voting application.

Kansei Engineering approach is used in this research because of its ability to identify and to translate user's emotional factors into element design concept of user interface for e-Voting application[3]. Kansei Engineering is a method that assimilates kansei (feeling), psychology, engineering, and statistics [4]-[6]. Kansei engineering is potential to develop an application that matches the the heart and mind of user. Kansei Engineering's methodology consits of systematic processes to discover the insights of user's responses toward the targeted application including e-Voting application via several psychological assessment methods[7]. The final result can be a knowledge to be translated into the detail specification of user interface element designs.

This research focuses on investigation of e-Voting application in order to provide better election environment as democracy activity, and also attempts to apply Kansei Engineering to analyze user's emotional preferences related to e-Voting application through its user interface. Multivariate statistical analysis is introduced in order to calculate and analyze the data questionnaire [8][9][10]. The main aim of this research is to explore the internal e-Voting by analyzing the relationships between user's emotional feelings and it's user interface. The result of this research is a recommendation for developer to enhance user interface of e-Voting application.

## 2. Research Methodology

Kansei Engineering Method Type I is a basic method that has been adopted in many product developments including program application [11][12][13][14][15]. As shown in Fig. 1, in genearal it consists of the systematic processes as folows:

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1. Gathers the popular samples of user interfaces for e-Voting application. These samples are used as specimens in this research.
2. Collects adjective words or a phrase as Kansei words in order to illustrate the user's emotional feelings about the appearance of user interface of e-Voting application.
3. Gathers some users to be as respondents who will participate in data collection for e-Voting application.
4. Evaluates the data questionnaires using multivariate analysis to calculate the impact of each Kansei words related to e-Voting application.
5. Partial Least Square is used to explore design elements based on user's data questionnaires and specimens' design elements, then generates a recommendation of design elements for a new user interface.
6. Generates a recommendation that contains the specification of element designs for user interface of e-Voting application.

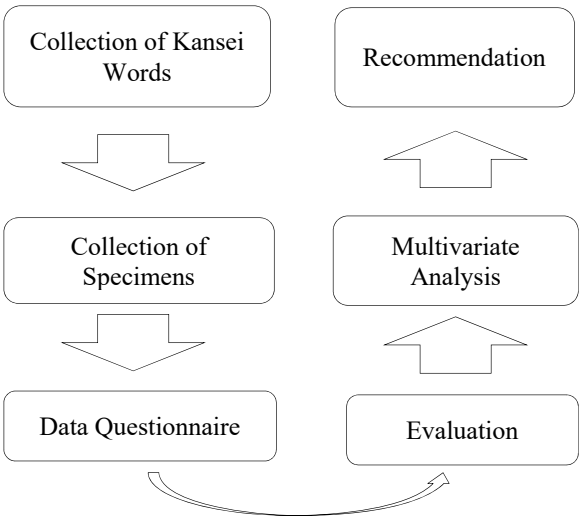


**Fig. 1** Reseach Methodology.

## 3. Result and Discussion

### 3.1 Kansei Words Collection

This research collects many adjectives as Kansei words that have a close relationship with e-Voting application. We process all candidate adjective according to the following process.

1. Collect adjectives as much as possible that has a relationship with e-Voting appliation. The related adjectives can be found in related literatures and user interviews.
2. Devide Kansei words into several categories according to their similarity of meaning or opposite meaning.
3. Choose only one Kansei word from two or more Kansei words that have the similarity.
4. Decide the selected Kansei words to be used for data questionnaire.

After conducting the above processes in detail, this research find only ten adjectives ("natural", "modern", "pleasant", "simple", "classic", "calm", "attractive", "harmony", "elegant", "formal"), and can be considered as Kansei words in data questionnaire. Based on these ten Kansei words we collect data questionnaire using five points semantic differential scale.

### 2.2 Specimens Collection

In this case we create five designs of user interface of e-Voting applications as specimens. Each design must be unique, so we make sure that the design of all specimens have different appearances according to each characteristic. We explore in detail all specimens, and create a table of element designs based on all specimens. Therefore, there are four main categories of components, such as header, body, picture, and footer. The summary of element designs classfication is described in Table 1.

**Table 1:** Element Design of All Specimens

| ***Element Design*** | ***Sp1*** | ***Sp2*** | ***Sp3*** | ***Sp4*** | ***Sp5*** |
|---|---|---|---|---|---|
| **Header** | | | | | |
| *Font Type | Arial | Centu-ry | Times NR | Arial | Taho-ma |
| *Font Size | 36 | 36 | 40 | 38 | 38 |
| *Font Color | Black | Dark-Blue | Brown | Dark-Blue | Black |
| **Body** | | | | | |
| *Bg Color | Gray | White | White | Gray | White-Blue |
| **Picture** | | | | | |
| *Font Type | Arial | Times NR | Arial | Taho-ma | Centur y |
| *Border | Yes | No | No | No | Yes |
| **Footer** | | | | | |
| *Font Type | Taho-ma | Times NR | Times NR | Centu-ry | Arial |
| *Font Color | Brown | Black | Black | Brown | Dark-Blue |

## 2.3 Data Questionnaire

This research selects ten Kansei words, and constructs a checklist for data questionnaire using five-point semantic differential scale to show the level of users' emotional feelings towards each specimen of the e-Voting application. Participants who were involve in this experiment are thirty people who represent the users' e-Voting. we ask them to observe each specimen one by one for a while (aproximately 45-60 seconds), after that we ask them to fill out the checklist due to their feeling about specimens. The evaluation results from all participants are calculated to find the average scores of each specimen according to each Kansei word, as shown in Table 2. The average scores all specimens (Sp) are between 2 and 4. First of all, it must be checked about data validation by calculating cronbatch's alpha using XLStat. According to the data in Table 2 the cronbatch's alpha value is 0,7. It means that the data questionnaires are valid and the next analysis can be continued in more detail using following multivariate analysis such as coefficient correlation analysis, factor analysis and pearl least square.

**Table 2**: The Average of Data Questionnaire

| *Kansei Word* | *Sp1* | *Sp2* | *Sp3* | *Sp4* | *Sp5* |
|---|---|---|---|---|---|
| Natural | 4 | 3,2 | 2,8 | 2,8 | 3 |
| Modern | 3,8 | 3,57 | 3,37 | 3,8 | 3,43 |
| Pleasant | 4 | 3,53 | 3,63 | 3,7 | 3,4 |
| Simple | 3,7 | 3,6 | 3,87 | 3,77 | 4 |
| Classic | 4 | 3,9 | 3,83 | 3,8 | 3,67 |
| Calm | 3,3 | 3,4 | 3,4 | 3,37 | 3,1 |
| Attractive | 3,57 | 3,53 | 4,03 | 3,6 | 3,63 |
| Harmony | 3,97 | 3,63 | 3,43 | 3,7 | 3,83 |
| Elegant | 3,7 | 3,67 | 3,87 | 3,7 | 3 |
| Formal | 3,37 | 2,6 | 2,5 | 2,4 | 2 |

## 2.4 Kansei Words' Relationship

Coefficient correlation analysis is used to find the relationship between Kansei words according to data questionnaire. The detailed result are shown in Table 3 and Table 4. We find that the strong relationship between two Kansei words is identified by identifying coefficient values that are close to 1. There are three very strong relationships that have a coefficient value of more than 0,9, such as "classic"-"formal", "pleasant"-"formal", and "calm"-"elegant". The coefficient corelation value between "formal" and "classic" is -0,647, which means that the relationship between them is very weak. The results of this relationships can be used to give alternative recommendation for element designs.

**Table 3:** The Result of Coefficient Correlation Analysis

| | *Natural* | *Modern* | *Pleasant* | *Simple* | *Classic* |
|---|---|---|---|---|---|
| ***Natural*** | **1** | 0,510 | 0,710 | -0,444 | 0,738 |
| ***Modern*** | 0,510 | **1** | 0,715 | -0,558 | 0,526 |
| ***Pleasant*** | 0,710 | 0,715 | **1** | -0,465 | 0,817 |
| ***Simple*** | -0,444 | -0,558 | -0,465 | **1** | -0,814 |
| ***Classic*** | 0,738 | 0,526 | 0,817 | -0,814 | **1** |
| ***Calm*** | -0,096 | 0,201 | 0,352 | -0,705 | 0,600 |
| ***Attractive*** | -0,471 | -0,657 | -0,113 | 0,453 | -0,178 |
| ***Harmony*** | 0,735 | 0,588 | 0,397 | -0,029 | 0,174 |
| ***Elegant*** | 0,075 | 0,276 | 0,588 | -0,626 | 0,711 |
| ***Formal*** | 0,854 | 0,585 | 0,917 | -0,647 | 0,956 |

**Table 4:** The Reulst of Coefficient Correlation Analysis

| | *Calm* | *Attractive* | *Harmony* | *Elegant* | *Formal* |
|---|---|---|---|---|---|
| ***Natural*** | -0,096 | -0,471 | 0,735 | 0,075 | 0,854 |
| ***Modern*** | 0,201 | -0,657 | 0,588 | 0,276 | 0,585 |
| ***Pleasant*** | 0,352 | -0,113 | 0,397 | 0,588 | 0,917 |
| ***Simple*** | -0,705 | 0,453 | -0,029 | -0,626 | -0,647 |
| ***Classic*** | 0,600 | -0,178 | 0,174 | 0,711 | 0,956 |
| ***Calm*** | **1** | 0,243 | -0,597 | 0,946 | 0,392 |
| ***Attractive*** | 0,243 | **1** | -0,728 | 0,336 | -0,194 |
| ***Harmony*** | -0,597 | -0,728 | **1** | -0,469 | 0,379 |
| ***Elegant*** | 0,946 | 0,336 | -0,469 | **1** | 0,577 |
| ***Formal*** | 0,392 | -0,194 | 0,379 | 0,577 | **1** |

We groups all Kansei words by four categories very strong, strong, weak, and very weak as shown in Table 5.

**Table 5**: Level of Kansei Words's Relationship

| *Category* | *Relationship* |
|---|---|
| Very strong | Classic-Formal, Pleasant-Formal, Calm-Elegant |
| Strong | Naturan-Pleasant, Natural-Harmony, Natural-Formal, Modern-Pleasant, Modern-Attractive, Pleasant-Classic |
| Weak | Natural-Modern, Modern-Classic, Modern-Harmony, Modern-Elegant, etc |
| Very weak | Calm-Natural, Attractive-Modern, Harmony-Attractive, etc |

## 2.5 Factor Analysis

This analysis is used to find which user's emotional feelings (Kansei word) have a great impact on e-Voting application through it's user interface. Table 6 shows the result of factor analysis. We find two factors that have cummulative value of more than 60%. So, we are able to continue to analyze to find the strength of each Kansei word.

**Table 6:** Emotional Factors

| | ***D1*** | ***D2*** | ***D3*** |
|---|---|---|---|
| Variability (%) | 38,932 | 31,514 | 21,461 |
| Cumlative % | 38,932 | 70,445 | 91,906 |

According to these two factors, then we try to find which emotional feelings have a big impact on e-Voting application. Table 7 shows that in the first factor D1 there are Kansei words of "pleasant" and "harmony" have a big impact because their value is more than 0,8. While in the second factor D2, there are two Kansei words of "calm" and "elegant" that have more value than 0,8. Finally we selects the Kansei word "calm" which has a value 0,989, as well as the Kansei word "formal" which has a value 0,944. Next, we continue to consider these two Kansei words to find element designs in the next analysis.

**Table 7:** The Result of Factor Analysis

| ***Kansei Word*** | ***D1*** | ***D2*** |
|---|---|---|
| Natural | 0,851 | -0,130 |
| Modern | 0,522 | 0,175 |
| Pleasant | 0,893 | 0,251 |
| Simple | -0,359 | -0,718 |
| Classic | 0,794 | 0,539 |
| Calm | 0,109 | **0,989** |
| Attractive | -0,109 | 0,143 |
| Hamony | 0,534 | -0,605 |
| Elegant | 0,376 | 0,881 |
| Formal | **0,944** | 0,305 |

According to Table 5, the Kansei word "calm" and the Kansei word "elegant" have a very strong relationship. On the other hand, according to factor D2 in Table 7, the result of factor analysis of "elegant" is 0,881 and we can also considers this Kansei word in deciding element designs for the user interface.

## 2.6 Element Design Translation

The final process of this research is element designs calculation using Partial Least Square (PLS). PLS calculates the data in Table 1 and Table 2 to generate element designs based on all Kansei words. However, according to the result of factor analysis, the best impact of emotional feeling is "calm", so based on this Kansei word we conduct PLS's calculation to translate it into element designs. By calculating the range value among the coefficient values of element designs in each category, it can be found that the value of element designs to be set. Table 8 shows the values of each element design.

**Table 8**: The Result of PLS

| ***Element Design*** | | ***Coefficient Value*** | ***Selected Value*** |
|---|---|---|---|
| Header Font Type | Arial | -0,143 | |
| | Century | 0,083 | √ |
| | Times NR | 0,035 | |
| | Tahoma | 0,057 | |
| Header Font Size | 36 | 0,075 | √ |
| | 38 | -0,153 | |
| | 40 | 0,050 | |
| Header Font Color | Dark Blue | 0,035 | √ |
| | Black | -0,057 | |
| | Brown | 0,029 | |
| Body Background Color | Gray | 0,011 | |
| | White | 0,083 | √ |
| | White Blue | -0,078 | |
| Picture's Font Type | Arial | 0,083 | √ |
| | Century | 0,075 | |
| | Times NR | -0,153 | |
| | Tahoma | -0,022 | |
| Border | Yes | -0,050 | |

| *Element Design* | | *Coefficient Value* | *Selected Value* |
|---|---|---|---|
| | No | 0,050 | √ |
| Footer Font Type | Arial | 0,097 | √ |
| | Century | 0,057 | |
| | Times NR | -0,022 | |
| | Tahoma | -0,153 | |
| Footer Font Color | Dark Blue | 0,011 | |
| | Black | -0,057 | |
| | Brown | 0,057 | √ |

### 2.6 Recommendation of Element Design

In the final process according to the result in Table 8, we find that the selected element design's value is the greatest value. Therefore, we conclude to make a recommendation for a user interface specification for the e-Voting application based on Kansei word "calm" as follows:

- Header Font Type : Century
- Header Font Size : 36
- Header Font Color : Dark Blue
- Body Background Color : White
- Picture's Font Type : Arial
- Picture's Border : No
- Footer Font Type : Arial
- Footer Font Color : Brown

## 3. Conclusion

Kansei engineering has been adopted in this research to analyze users' emotional feelings related to the user interface of the e-Voting application. Emotional feelings shown by Kansei words are translated into the design concept for the user interface of the e-Voting application. Statistical multivariate is used to analyze each specimen of the e-Voting application and to determine which emotional feeling has the biggest impact on the e-Voting application.

According to the result of factor analysis, the user's emotional feeling that have the biggest impact on the e-Voting application is "calm" and the alternative is "formal". Therefore, this research recommends revising its user interface with the specification of element design for developing the appearance of the e-Voting application.

Further research is proposed to investigate users' preferences based on more population in order to find more detailed element designs. For example, we ask users to participate in a data questionnaire based on several different regions in Indonesia, in order to develop a unique user interface for the e-Voting application.

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**Abdurrohman** received the S.T degree from from STT Bandung in 2016. He received the M.Kom. degree from STMIK-LIKMI Bandung in 2018. He has been working at PT. INTI Indonesia. From 2019 he has been working as lecturer at STT Bandung Indonesia. He is a PhD student at Asia e Univiersity Malaysia. His research interest includes Kansei Engineering, Software Engineering, Enterprise Architecture, Networking, and Information System.

**Aedah Abd Rahman** is an associate professor at the School of Graduate Studies (ICT), Asia e University Malaysia. Her research interest includes E-Learning System, Web Analysis, Data Mining, and Information System.

**Ana Hadiana** received the B.Eng. and M.Eng. degrees, from Fukui University in 1993 and 1995, respectively. He received the Dr.Eng. degree from Shinsyu University in 2004. After working as a researcher (from 2004) at Research Center for Informatics – Indonesian Institute of Sciences (LIPI), he worked as research assistant at National Institute of Informatics (NII) Japan (2006-2007). He is also lecturer at Graduate School of STMIK-LIKMI Bandung. From 2021 he has been working as professor at National Research and Innovation Agency (BRIN) Indonesia. His research interest includes Kansei Engineering, Enterprise Architecture, E-Learning System, Data Mining, and Information System.

**Anitawati Mohd Lokman** is a professor at the Faculty of Computer & Mathematical Science, Universiti Teknologi MARA, Malaysia. She has more than 100 publications, which includes books, journal article, conference proceedings, and other publications locally and internationally. Her research interest includes Emotional UX, Emotion & Design, Kansei Engineering, and Happiness & Wellbeing.