An affective e-commerce design for SMEs product marketing based on kansei engineering

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Abstract. One of the SMEs problems in Indonesia in this information technology era is the inability to control the market. SMEs can use the e-commerce website to improve their competitiveness. It can be used as a marketing tool for SMEs to promote their products and expands the SMEs markets especially for the agroindustry SMEs where located in district area that still rely on local markets to sell their product. Some SMEs e-commerce websites have been developed in Indonesia but can not significantly increased the sales of SMEs product. Furthermore, the design of it is only able to meet the consumer need in function and usability. The development of e-commerce design should pay attention in high affective quality. This is because the affective response effect the user's perception of cognitive quality, usability and ease of use of e-commerce. This study is aimed to make e-commerce that can meet the affective needs of users. The result of Kansei words selection and extraction using TF-IDF are four design concepts of e-commerce website. The formulation of new SMEs e-commerce website design is resulted from the integration of four design concepts and four design elements. The “Natural-Formal” concept has the greatest value than other concepts after QTT-1 analysis. This concept can be implemented as the new SMEs e-commerce website design.

1. Introduction
Small and Medium Enterprises (SMEs) is one of the most important actors in Indonesia’s development. In the last five years, agroindustry SMEs were able to contribute 48.85 percent to Gross Domestic Product (GDP) through tax payments [1]. One of the problems of SMEs in Indonesia in the current era of information technology is the inability to attract the market. SMEs are not able to compete with other types of businesses that already adapt information technology in advance attract the market. This is the reason for the need of an information technology application for SMEs in order to encourage its growth in the current information technology era [2]. E-commerce can be used as a marketing tool for SMEs in promoting their products and expanding their product marketing network. E-commerce can be very helpful, especially agroindustry SMEs in the district area who still rely on local markets to sell their products. Using the e-commerce owners can increase revenue of the product and reducing operation and maintenance costs [3]. So the SMEs can improve their product competitiveness.

Nowadays there are some e-commerce sites that have been developed in Indonesia mostly to sell SMEs’s product. For example krafie.com, usahadesa and kriya.com but their existing still can not significantly increased the selling of SMEs’s product. These sites are a place for SMEs to sell their...
products online and are considered able to advance SMEs [4]. The competition between e-commerces in Indonesia was very tight, the SMEs’s e-commerce have to compete with the bigger e-commerce websites which first succeed in Indonesia. The various offers of e-commerce have caused today’s consumer have become further sophisticated then ever. The consumers desire product that match their own feelings of design [5]. [6] say initially e-commerce designers just focus on cognitive and usability function, whereas affective quality becomes more important than ever because the technology advances. Good affective quality of the e-commerce will affect its cognitive quality. So the developers of e-commerce have to meet the affective needs of e-commerce users. One method that can be used to determine the affective need of users is Kansei Engineering.

Kansei Engineering (KE) is a technology to assimilate human kansei to product design [7][8], in this paper the product is SMEs e-commerce website. The development of website design according to user concept will make the user have emotion with the website. In Indonesia, [9] using KE to design e-learning website interface and [10] using KE to evaluate the visual usability on mobile ecotourism applications. Our objective in this research are (1) to generate the new design concept of e-commerce website, (2) to identify the relevant e-commerce design element (3) to formulate the concept design of SMEs e-commerce website. The design could be used by SMEs e-commerce developers to make their emotionally appealing design better. This development would make user more satisfied and would increase sales of the product.

2. Research Methodology

This research frameworks are adopted based on [5], [6] and [11] to accomplish the research objectives. In this paper, SMEs e-commerce website has been chosen as product domain to develop. Furthermore, the research methodology is represented in Figure 1.

![Figure 1. The methodology of the research](image-url)

The research was began with the determination of the e-commerce users. The users of this e-commerce are consumer of agroindustry SMEs, owners and local government. Afterward, the KW were
collected from literature research and then followed by selecting and extracting them using Term Frequency-Inverse Document Frequency (TF-IDF) and Principal Component Analysis (PCA) method to achieve the first objective. From this, representative KW were chosen and were became the strategies of new e-commerce website design. For the second objective, design elements were identified for each sample collected and were evaluated according the new design concept. Finally, the new concept and design elements were synthesized using Quantification Theory Type I (QTT-1) method. In this step, once questionnaire were given to the users to evaluate e-commerce properties based on strategy design. R language software was used as a tool of data processing.

3. Result and Discussion

3.1 New Design Concept Identification

In this phase, firstly thirty Kansei words have been collected from literature research which illustrated SMEs e-commerce website. The KW that have been collected is represented in Table 1.

| Number | Kansei Words | Weight | Number | Kansei Words | Weight |
|--------|--------------|--------|--------|--------------|--------|
| 1      | Elegant      | 1.5    | 16     | Crowded      | 1.3    |
| 2      | Feminine     | 1.5    | 17     | Impressive   | 1.3    |
| 3      | Formal       | 1.6    | 18     | Calm         | 1.3    |
| 4      | Warm         | 1.3    | 19     | Bright       | 0.7    |
| 5      | Beautiful    | 1.1    | 20     | Unique       | 0.9    |
| 6      | Informative  | 1.3    | 21     | Lively       | 1.3    |
| 7      | Childish     | 1.3    | 22     | Comfortable  | 1.1    |
| 8      | Classic      | 1.5    | 23     | Fresh        | 1.6    |
| 9      | Interesting  | 1.4    | 24     | Simple       | 1.6    |
| 10     | Sweet        | 1.5    | 25     | Natural      | 1.8    |
| 11     | Cool         | 1.4    | 26     | Neat         | 0.9    |
| 12     | Creative     | 1.5    | 27     | Cute         | 1.3    |
| 13     | Interesting  | 1      | 28     | Fun          | 1.6    |
| 14     | Luxury       | 1.5    | 29     | Futuristic   | 1.8    |
| 15     | Modern       | 1.3    | 30     | Chic         | 1.3    |

These KW were evaluated using TF-IDF and researcher take 12 KW that have weight more than 1.5. They are elegant, feminine, formal, classic, sweet, creative, luxury, fresh, simple, natural, fun and futuristic. Thus, the result of evaluation has been analyzed using Principal Component Analysis (PCA) method in order to reduce the dimension of KW collected and followed by generating new concepts design. Principal components (PC) are computed based on evaluation of twelve Kansei words using semantic differential questionnaire. PCA method is used to decide which of principal component will be retained according to Kaiser’s criterion proposed by Coghlan. The result of variances each principal component is shown in Table 2. Suhr says cumulative proportion of variance explained can be 70-80% based on Kaiser criterion too [12]. The result show that PC1 until PC4 have significant slope and they total proportion of variance 76%. These four PC were chose to be developed as design concept of the SMEs e-commerce website.
Table 2. The value of variances and proportion of variance.

|     | Variance | Proportion of variances | Cumulative Proportion |
|-----|----------|-------------------------|-----------------------|
| PC1 | 1.75     | 0.26                    | 0.26                  |
| PC2 | 1.62     | 0.22                    | 0.47                  |
| PC3 | 1.47     | 0.18                    | 0.65                  |
| PC4 | 1.13     | 0.11                    | 0.76                  |
| PC5 | 1.07     | 0.10                    | 0.86                  |
| PC6 | 0.86     | 0.06                    | 0.92                  |
| PC7 | 0.82     | 0.06                    | 0.97                  |
| PC8 | 0.56     | 0.03                    | 0.99                  |
| PC9 | 0.13     | 0.001                   | 1.00                  |

3.2 Design elements
In order to answer the second research objective, nine e-commercines which popular in Indonesia have been collected. There are three SMEs e-commerce websites that have been collected for sample and others are popular e-commercines in Indonesia. The result of design element identification phase showed that there were 4 categories of design elements, it shown in Table 3. Each design element has different from types of its own, ranging from two until three. The next step is evaluating 4 pair of concepts based on 9 samples of e-commercines design. This evaluation using semantic differential questionnaire with 1-7 point scale, where 1-7 represented standard look and the most attractive look, respectively. Table 4 shows the assessment result, as following:

Table 3. Design elements.

| Element design | 1   | 2   | 3   |
|----------------|-----|-----|-----|
| X1 Body background color | white | grey |
| X2 Typography         | custom | standard |
| X3 Page style          | frame | table | none |
| X4 Dominant item       | picture | ads | text |

Table 4. Numerical data source for nine representative e-commerce website samples.

| Sample | X1 | X2 | X3 | X4 | Natural - Formal | Simple - Complex | Classic - Modern | Standard - Fresh |
|--------|----|----|----|----|------------------|------------------|------------------|------------------|
| 1      | 1  | 1  | 1  | 1  | 3.6              | 5.1              | 4.9              | 5.9              |
| 2      | 2  | 1  | 2  | 3  | 3.9              | 4.2              | 3.6              | 3.8              |
| 3      | 2  | 1  | 1  | 2  | 4.2              | 4.7              | 3.7              | 4.3              |
| 4      | 1  | 2  | 2  | 3  | 4.8              | 3.7              | 4.6              | 4.0              |
| 5      | 1  | 1  | 1  | 2  | 5.4              | 5.0              | 4.9              | 5.6              |
| 6      | 2  | 1  | 3  | 2  | 3.9              | 5.6              | 4.0              | 4.8              |
| 7      | 2  | 1  | 1  | 2  | 4.3              | 5.3              | 4.9              | 4.6              |
| 8      | 1  | 1  | 3  | 2  | 4.3              | 3.3              | 3.3              | 3.6              |
| 9      | 1  | 2  | 1  | 1  | 4.8              | 3.2              | 4.0              | 3.3              |
3.3 New SMEs e-commerce website design formulation

The last step was to examine the relationship between four design elements (independent variables) and four pairs of design concepts (dependent variable) using QTT-1 method. In this study calculation QTT1 are supported by R software, to generate R-square value, optimum category grade, and partial correlation coefficient (PCC). From R-square value shows that "Natural-Formal" concept has the highest value than other concepts; 0.91. So "Natural-Formal" concept will be used as a main image of SMEs e-commerce website design. The result of formulation design showed in Figure 2 and Table 5. The partial correlation coefficients (PCC) indicates the relationship between the four design elements and a pair of design concepts. The highest variable of PCC on "Natural-Formal" concept was "Page style" (X3 = 0.93), so this variable was great influence on customer perception.

![QTT1 bar graphic score category of natural-formal concept.](image)

**Figure 2.** QTT1 bar graphic score category of natural-formal concept.

| Design Elements | Type | Category grade (from type grade) | Partial correlation coefficient (PCC) |
|-----------------|------|----------------------------------|--------------------------------------|
|                 |      | Natural | Formal |                  |
| X1 Body background color | X1.1 | body background color | white | 0.35 | 0.89 |
|                  | X1.2 | body background color | grey | -0.43 |      |
| X2 Logo typografy | X2.1 | logo typografy | custom | -0.03 | 0.25 |
|                  | X2.2 | logo typografy | standard | 0.09 |      |
|                  | X3.1 | page style | frame | 0.5 | |
|                  | X3.2 | page style | table | -0.59 | 0.93 |
|                  | X3.3 | page style | none | -0.12 |  |
|                  | X4.1 | dominant item | picture | -0.5 |  |
|                  | X4.2 | dominant item | ads | -0.03 | 0.88 |
|                  | X4.3 | dominant item | text | 0.58 | |

Constants = 4.4
R square = 0.91
R square = 0.65
4. Conclusion
This research focused on SMEs with agroindustry product to demonstrate how Kansei Engineering using QTT-1 Analysis was applied to assist e-commerce designers in decision making of the new SMEs e-commerce website design. The result of TF-IDF showed 12 KW have been selected, then they were extracted using PCA method and become 4 strategies of the new e-commerce design concept. They are “Natural-Formal”, “Simple-Complex”, “Classic-Modern” and “Standard-Fresh”. Four concepts were analyzed with four design elements (body background color, logo typography, page style and dominant item) of the e-commerce website using QTT-1 analysis. The result showed that “Natural-Formal” concept has the greatest value of R² than others. This design concept is recommended for a new SMEs e-commerce website design.

References
[1] Bank Indonesia 2015 Micro Small and Medium Enterprises Business Profile
[2] Sudaryanto R and Wijayanti R 2011 Strategy of SMEs Empowerment Facing Asean Free Market Economy Global J. Management and Business Research: B Economics and E-commerce 16 (01)
[3] Khan A G 2016 Electronic Commerce: A Study on Benefits and Challenges in an Emerging Economy Global J. Management and Business Research: B Economics and E-commerce 16 (01)
[4] Ramadhani S 2017 Five E-Commerces in Indonesia for SMEs More Forward. Available: http://goukm.id/e-commerce-marketplace-untuk-ukm/
[5] Lookman A M and Noor N M 2006 Kansei Engineering Concept in E-commerce website. Proc. in Int. Conf. on Kansei Engineering and Intelligent Systems (pp. 117-124) KEIS 06
[6] Lookman A M, Noor N M, and Nagamachi M 2008 Kansei Database System For Emotional Interface Design of E-Commerce Website. Proc. in The Fourth International Cyberspace Conference on Ergonomics (Cyberg 08)
[7] Nagamachi M 1999 Kansei Engineering: The Implication and Applications to Product Development. Proc. in 1999 IEEE International Conference
[8] Nagamachi M 2011 Kansei/affective engineering (CRC Press).
[9] Wicaksono F, Hadiana A and Asfi M 2016 Kansei Engineering Implementation on Web Based E-Learning Interface Design. Proc. Nat. Conf. of Information Technology and Multimedia 2016 4 (1)
[10] Aktiva R, Yani N, and DjaTna T 2015 A Design of Visual Usability for Ecotourism Mobile Application Using Kansei Engineering (Master’s thesis Bogor Agricultural University).
[11] Lookman A M and Noor N M 2008 Kansei Engineering: A Study on Perception of Online Clothing Websites. Proc. of the 10th Int. Conf. on Quality Management and Operation Development 2008 (QMOD ’07)
[12] Suhr D D 2005 Principal Component Analysis vs Exploratory Factor Analysis. Proc. SUGI 30