A System Analysis and Design for SMEs Product Presentation on E-commerce Website based on Kansei Engineering (Case Study: SMEs Products of Ponorogo Regency)

Anik Nur Habyba[1], Taufik Djatna[2] and Elisa Anggraeni[3]

[1,2,3] Graduate School Program of Agro-Industrial Technology, Bogor Agricultural University, Bogor, Indonesia
[1] anik_bibib@apps.ipb.ac.id

Abstract. Nowadays, various e-commerce websites are readily accessible to consumers and are increasing rapidly over time. The vast advantages provided by e-commerce websites have made consumers become more sophisticated. Consumers will choose the e-commerce that matches their own feeling rather than the ones that could function well. Kansei Engineering (KE) is a technology to assimilate human *kansei* for a product and design variable. Previously, there were many studies that applied KE on e-commerce website design. Among them are the ones that focus on e-commerce design. However, there is still no study that pays attention in product presentation design on e-commerce website based on KE. The development of e-commerce website design for Ponorogo's SMEs product marketing can focus on affective quality of the design. The affective responses that affect the user's perception of cognitive quality, usability and ease of use of e-commerce. The development of SMEs e-commerce website design should be able to meet the consumers' expectation. The good affective quality is one of the pleasure factor of the consumer's needs. This study is aimed to make SMEs product presentation on e-commerce website to meet the affective needs of the user by using Kansei Engineering. The BPMN is used to analyse the process design of the SMEs e-commerce website. The result of Kansei words selection and extraction using TF-IDF and PCA are three design concepts. The formulation of new SME e-commerce website results from the integration of three design concept and four design elements. The "Modern" concept has the greatest value than other concepts after QTT-1 analysis.

Keywords: E-commerce Website, Kansei Engineering, SMEs Product, System Analysis and Design

1   Introduction

The advances in Information Technology have affected the daily activities of the society. Various activities that are currently mostly done online is shopping. People can easily buy a product by accessing the e-commerce website. Nowadays, many e-

commerce websites are already accessible to consumers and increasing rapidly over time. The vast advantages provided by e-commerce have made consumers become more sophisticated. They will choose the e-commerce that matches their own feeling rather than the ones that could function well [1]. This fact shows that consumer's need is an important role in product development process and could determine product success in the market. Emotional experience as the implicit need of consumers is difficult to quantify and become today's focus on product development [2]. Good affective product design will support the cognitive quality and influence consumers to purchase the product [3].

One method that can be used to determine the affective need of users is Kansei/Affective Engineering. Kansei Engineering (KE) is a technology to assimilate human kansei for a product and design variable [4-5]. Kansei Engineering has been applied in many studies especially in website interface. KE is used to design visual usability for ecotourism mobile application [6]. Furthermore, previously there were many studies that applied KE on e-commerce website design, for example Batik fabric online [7], online clothing website [8-11], images sunglasses on e-commerce web page [12]. Among many studies that focus on e-commerce design there is still no study that pays attention in product presentation design on e-commerce website based on KE. Furthermore, this study also analyses the system of process design which involves some stakeholders in it.

E-commerce has gained a lot of attention due to its rapid growth which led to intense competition among e-commerce websites. The developers are competing with one another to improve their customer satisfaction. In Indonesia, the Ministry of Cooperatives and SMEs together with the Ministry of Communications and Informatics are committed to making 8 million Micro, Small and Medium Enterprises (MSME) to go online until 2020 [13]. The Government realised that there are countless benefits of e-commerce that can support the MSME development. The e-commerce benefits for SMEs in developing countries like Indonesia were identified by [14]. E-commerce has many benefits to the Indonesian SMEs market reach namely increased sales, improvements in external communication, company image, the speed of data processing and employee productivity. The programme stimulates the existence of some e-commerce websites specifically to sell Indonesian SMEs product.

Indonesia as a developing country gives more attention to its MSME development. The contribution of the MSME to the Gross Domestic Product (GDP) has been increasingly wriggling in the last five years. The Ministry of Cooperatives and Small and Medium Entreprises (SMEs) noted that the contribution of the MSME sector has increased from 57.84 % to 60.34 % [15]. These result coincided with the increasing number of Indonesian MSME. In 2013, the number of the MSME in Indonesia reached about 57.9 million units [16]. The Indonesian MSME must increase their competitiveness to be able to compete in the global marketplace.

The Ponorogo regency is one of the areas in East Java, where most of their industries are MSME. According to the Central Bureau of Ponorogo Regency 2015, the number of formal SMEs in Ponorogo are 619 units [17]. For product marketing, they still rely on the local market whereas the competition in the global marketplace is tight. [18] suggested that due to the globalisation of the world economy, SMEs can

adapt e-commerce to increase their competitiveness and get countless benefits of it. For the adoption process, the SMEs e-commerce is complex where the customisation of the website is a complicated step. The SMEs e-commerce website must be supported by an adequate database. This can be the motivation of local government to take a role as one of the stakeholders who can resolve this problem.

A study by [19], suggested an integrated information technology marketing strategy for the MSMEs in West Nusa Tenggara and resulted an integrated model of MSMEs e-commerce system in Mataram. In April 2017, the Department of Commerce, West Nusa Tenggara Province launched an I-Shop NTB (ishopntb.com) to help their SMEs sell the products. Another study by [20], analysed and designed the SMEs e-commerce website for the Department of Industry and Commerce Denpasar City. Nowadays, there is a rumahbelanjadenpasar.com, an e-commerce that sells SMEs product that originates from Denpasar city. The Ponorogo Regency has also developed an e-commerce website to promote their products and expand their market.

The development of the e-commerce website design for the Ponorogo's SMEs product marketing is focus on the affective quality of the design. The affective responses affect the user's perception of cognitive quality, usability and ease of use of e-commerce. Hence, the Ponorogo's e-commerce is able to compete with the other e-commerce website that meets user's needs. The good affective quality is one of pleasure factor of the consumer's needs. In this paper, a formulation of the SMEs product presentation on e-commerce website design is proposed based on Kansei Engineering. The objectives in this study are (1) to generate the new design concept of the e-commerce website, (2) to identify the relevant e-commerce design element and (3) to formulate the concept design of the SMEs e-commerce website.

The remainder of this paper is organised as follows. Section 2 is the related works for analysis and design system of the SMEs product presentation on e-commerce websites based on KE. Section 3 presents the method. Section 4 presents the result and discussion and Section 5 is the conclusion of this paper.

2   Related Works

Systems requirement analysis is a very important aspect of the development of a system. This analysis is necessary to find out the needs or conditions that are in accordance with the actual system conditions that will be implemented later. A system in the form of a system entity is presented by [21] (see Fig. 1).

3   Method

3.1   Requirement Analysis and System Modelling

The conceptual design is done using Business Process Modelling Notation (BPMN) type 2.0. The Sybase Power Designer 16.0 SAP (2013) manual states that BPMN is a standard graphical notation that makes it easy to understand a system in business pro-

cesses not only by business people but also technical analysts and developers who have a role in configuring and monitoring the implementation of a system. BPMN is preferred to represent business processes because of its flexibility compared to other conceptual modelling languages. In addition, BPMN is more dynamic and can represent a business process in certain levels to detail a process in graphic form so it is more easily understood [22].
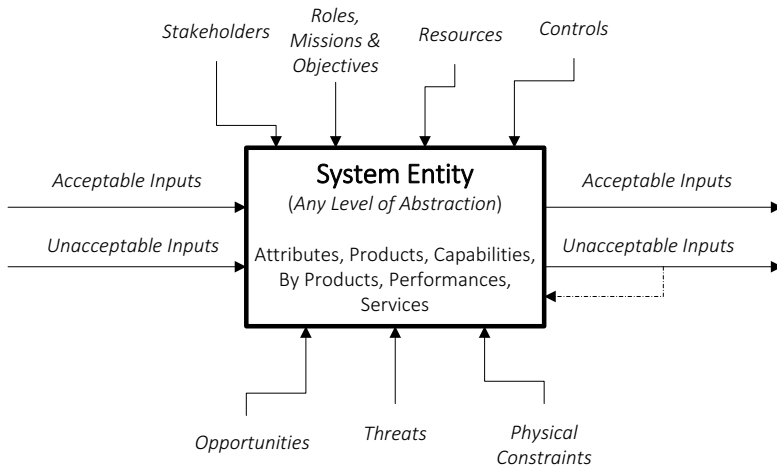

Fig. 1. System entity construction

3.2   Product Presentation Design in Kansei Words

This step is required to obtain the SMEs product presentation on e-commerce website that could increase the affect of user's perception. The Kansei words were derived from literature study. The KW that have been collected are selected and extracted by using the Term Frequency-Inverse Document Frequency (TF-IDF) and the Principal Component Analysis (PCA) method. The TFIDF is one of the text mining methods to show how important a KW by seeing how many times it appears in the questionnaire. The PCA is one of the statistical techniques to extract information from a large set of correlated variables into several main components, without the data diminishing the meaning of variability in the data. The representative of KW are chosen to become new design concept strategies will be developed.

3.3   Product Presentation Element Design Identification

The identification of element design in order to understand the important element that affects user's perception about the SMEs product presentation on e-commerce website samples. The identification process is helped by an expert designer and literature study is also used to make the designer certain about the elements.

3.4   Product Presentation Design Formulation

The formulation process is obtained as a result of analysing the process of the relationship between the KW design concepts and the relevant design elements. The Semantic differential scales (7 scales) were used in the questionnaire. The scales are from two extreme ranges "not at all" to "very much". The Quantification Theory Type 1 (QTT-1) method was used to synthesise the process. QTT1 is one of the statistical techniques and the most effective technique to generate a mathematical model of the relationship between Kansei word (y) and design elements (x_n).

4   Results and Discussion

4.1   Requirement Analysis and System Modelling

The system of the SMEs product presentation design on e-commerce website have two stakeholders, they are the designer and the e-commerce users. The system is focused on process design (see Fig. 2).
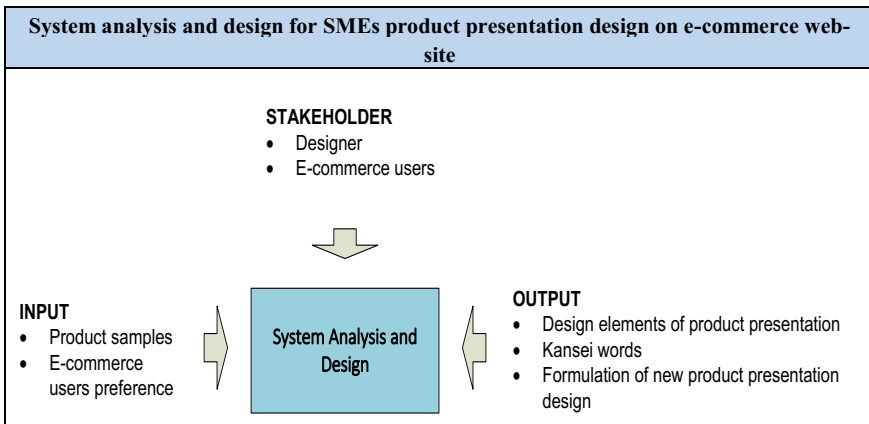

Fig. 2. System analysis and design for product presentation design on e-commerce website

The BPMN that represents all detailed relationship between process, sub processes, workflow, stakeholder and formulation that involved in the system was built. The BPMN is divided into 3 parts; which are the BPMN for determining product presentation concept design on e-commerce (see Fig. 3), identifying of product presentation element design (see Fig. 4), and formulating product presentation design (see Fig. 5).
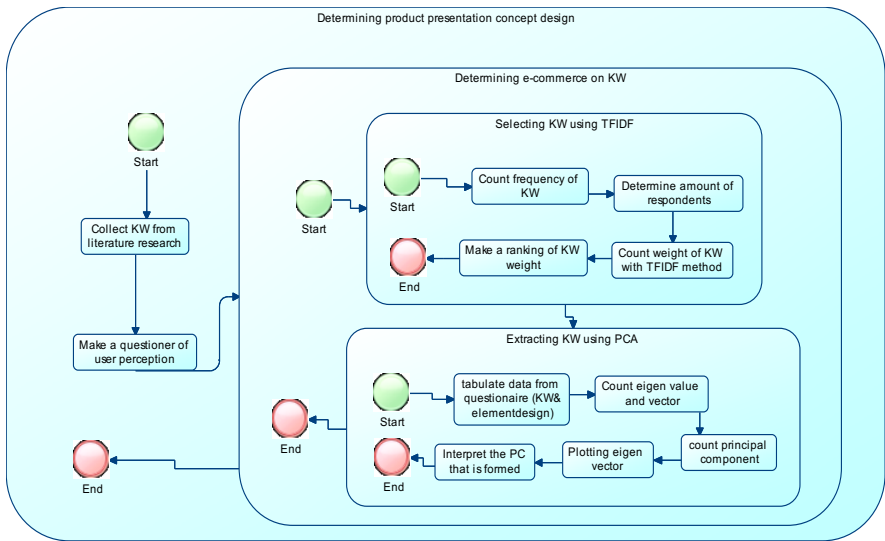
Fig. 3. The BPMN for determining product presentation concept design on e-commerce
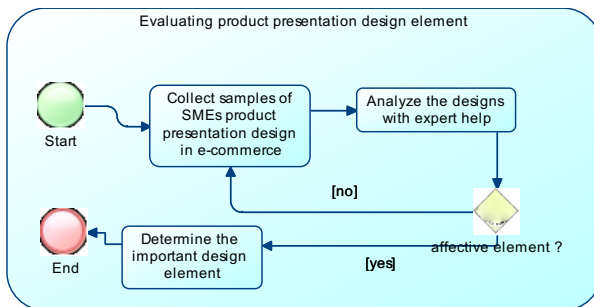

Fig. 4. The BPMN for identifying product presentation element design
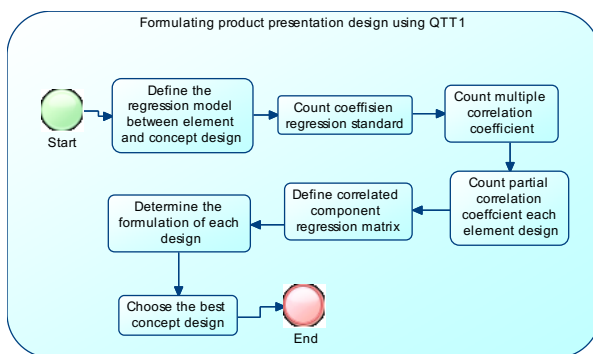

Fig. 5. The BPMN for formulating product presentation element design

4.2   New Concept of SMEs Product Presentation on E-commerce Website

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

Table 1. The weight of Kansei Words.

Num	KW	Weight	Num	KW	Weight	Num	KW	Weight
1	Trendy	1.3	11	Colourful	1.5	21	Elegant	1.5
2	**Modern**	**1.6**	12	**Exotic**	**1.6**	22	Stylish	1.5
3	**Aesthetic**	**1.6**	13	Lovely	1.5	23	Refreshing	1.5
4	**Nice**	**1.6**	14	Luxury	1.5	24	**Creative**	**1.8**
5	Attractive	1.5	15	Fun	1.5	25	**Natural**	**1.8**
6	Informative	1.1	16	Communicative	1.5	26	**Relaxing**	**1.8**
7	**Simple**	**1.6**	17	Innovative	1.5	27	Cute	1.2
8	Unique	1.3	18	**Ergonomic**	**1.8**	28	Professional	0.9
9	Eyecatching	0.8	19	Comfort	1.2	29	Appealing	1.5
10	Cool	1.3	20	Safety	1.2	30	**Chic**	**2.1**

The KW was evaluated using TF-IDF and 10 KW were taken with weighted more than 1.5. They are modern, aesthetic, nice, simple, exotic, ergonomic, creative, natural, relaxing and chic. Then, this result of evaluation has been analysed using the PCA in order to reduce the dimension of the KW collected and followed by generating new concepts design. The Principal Components (PC) are computed based on the evaluation of 10 KW using the semantic differential questionnaire. The PCA method is used to decide which of the principal component will be retained according to the Kaiser's criterion that was proposed by Coghlan. The result of the variances of each principal component is shown in Table 2. The cumulative proportion of variance explained can be between 70-80 percent based on the Kaiser criterion (Suhr, 2005). The result shows that PC1 until PC3 have a significant slope and total proportion of variance 78%. These three PC were chosen to be developed as design concept of the SMEs product presentation design.

Table 2. The value of variances and proportion of variance.

	Variance	Proportion of variances	Cumulative Proportion
PC1	**1.81**	**0.33**	**0.33**
PC2	**1.58**	**0.25**	**0.58**
PC3	**1.41**	**0.20**	**0.78**
PC4	1.16	0.13	0.91
PC5	0.62	0.04	0.95
PC6	0.59	0.03	0.98
PC7	0.38	0.01	0.99

4.3   E-commerce Design Element on Kansei Words

There are many e-commerce websites that have been collected as samples of the SMEs product presentation design on the e-commerce website. The result of design element identification is 4 relevant design elements, it shown in Table 3.

Table 3. Design Element.

	Design Elements	1	2
X1	Product listing page presentation method	Image text	Text only
X2	Product listing page information format	List	Array
X3	Product presentation format	Zoom features	Alternative views
X4	Seller information	Text only	Picture & text

4.4   Product Presentation Formulation

The last step was to examine the relationship between four design elements (independent variables) and three design concepts (dependent variable) using the QTT-1 method. The result is presented in Table 4.

Table 4. Value of category grade and partial correlation coefficient each concept design

Design Element		Natural		Relaxing		Modern	
		Category score	PCC	Category score	PCC	Category score	PCC
X1	X11	0.112	0.184	-0.400	0.471	-0.192	0.422
	X12	-0.168		0.600		0.288	
X2	X21	0.081	0.191	-0.026	0.050	-0.288	0.712
	X22	-0.188		0.060		0.673	
X3	X31	-0.178	0.357	0.223	0.357	0.090	0.269
	X32	0.267		-0.334		-0.135	
X4	X41	0.113	0.190	-0.379	0.460	-0.102	0.246
	X42	-0.113		0.379		0.102	
Constant		3.85		3.91		3.83	
R		-0.412		-0.228		0.313	
R^2		0.216		0.318		**0.618**	

The results show that from R-square value shows that "Modern" concept has the highest value than other concepts; 0.618. So "Modern" concept will be used as the main image of the SMEs product presentation on the e-commerce website. The partial correlation coefficients (PCC) indicates the relationship between the four design elements and a design concept. The highest variable of PCC on "Modern" concept is "Product listing page information format" (X2 = 0.712), so this variable was a great influence on user's perception.

5   Conclusion and Recommendation

The results of this study showed that the system consists of two stakeholders which are designer and e-commerce users. The new design concept of product presentation falls into three KWs. They are "Natural", "Relaxing", and "Modern". The identification of element design derived a four relevant element designs. They are product listing page presentation method, product listing page information format, and product presentation format and seller information. Finally, the formulation of a new SMEs product presentation design on e-commerce website using obtained "Modern" concept as the best new concept design. This concept has the highest R^2 so that fits to the statistical model and highly recommended. In order to realise this new design concept in text only product listing page presentation, array format of the information product, with zoom features and have pictures and text of seller information should be highlighted. In the future, a more detailed exploration of product presentation design elements is needed.

Acknowledgments

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