International Journal of Advanced Trends in Computer Science and Engineering

Physiognomic Characteristics towards MPV Car Design in Kansei Engineering

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ABSTRACT

This study discussed about the customer preferences towards the product design features based on Kansei Engineering. The purpose of this study is to find out what the customer characteristics based on physiognomy characteristics towards the emotional preferences (Kansei) on the car design features. By using developed questionnaires based on 5 Kansei words (Stylish, Comfortable, Safe, Sporty, Luxury) towards each of 6 car product design from MPVcar design type launched in Malaysia for years 2014 - 2015, the statistical method were then em-ployed to analyze the results data of 171 respondents against their needs and also to their individual face that were reconstructed to a facial model in order to find out the individual's customer characteristic related to physiognomic identity. The study found that Front Views of for MPV car types (Toyota Alphard Vellfire) has strong the correlation with customers' mouth, while Side View (Fiat Freemont) and Rear View (Fiat Freemont) have significant correlation towards nose and mouth respectively. Based on these finding, the study concluded that the CAR Product launched in Malaysia have strong correlation with Malaysian customers' physiognomy.

Key words : Physiognomic, Emotional response, Product Design, Kansei Engineering.

1. INTRODUCTION

In today's aggressive competitive market, to develop a new product that very relevant and match to the consumer' needs and tastes is as a critical issue in the product development as a part of business strategy. This is because of customer satisfaction has turned into a key component in business strategy and put at the highest point of the need list of each organization on how they can always suitable to deliver the market with their relevant products[1]-[2]. This is due to customers are more demanding and much more selec-tive in their choices [3]. In facts, they expect the pleasure through ful-filling of their emotions and psychological needs [4]. To enhance the engaging quality, the company has to launch an attractive product that should fulfill the objectives of individual customer needs [5].

Customers' affective needs that must be considered in designing the product based on the understanding of attractive designed prod-uct that engages to consumers [6]. The products are not only have to meet with the fiscal prerequisites of customers and thus relevant to characteristic of product installed with cutting edge advanced tech-nology, however also to additionally needs of fulfilling customers' affective needs in terms of psychologically satisfactory [7]. In order to ensure the product meet and satisfy the customers' needs and pre-requisites, therefore it is essential to work intimately with customers through incorporating customer requests that must be caught, meas-ured and suitably adapted by them [8] through a customer-focused approach in order to improve the attractiveness of the new products [3]. Towards quality issues above, a few elements of quality satisfaction related to product, administration quality, value, individual and situ-ational elements as representation of the consumer satisfaction level [9]. As far as product itself to consumer satisfaction incorporated with the product's accessibility that is best fit with the need of customer [10], it is, however, not only enough through the company's message in their merchandise intention based on the fulfilling of the physical prerequisites. The company is, therefore, also having to relevant to those which are important towards their eagerness triggered by psychological needs (feeling and emotions) [11]

Since the product image plays a significant role in consumers' preferences and choice of the product, the way of the customers look at the product image is generally not the same as the way that designers look at product characteristics [12]. The designers usually will design a product by considering the basic functions which is product quality, capacity, and

performance. However, customers will choose the products that are more required, attractive and ex-ceptionally delicate to their identities [13]. In extent to the satisfaction of basic requirements, they stated that consumers do not just look for the products that fulfill their physical requirements, but also to those which are carving their emotional needs as valuable factor to them. Therefore, from the design perspectives, the physical charac-teristics of the product is necessary to be connected to the custom-ers' perception of the product in order to best address customers' requirement of a product [12].

Thus, by addressing like pleasure issue, the solutions required to produce a good care of products against the actual desires as well as requirements should be connected with the users. The product design will implies the manufacturer to provide technology and design specifications for decision making based on consumer-orientation. However, since customer satisfaction is critical for es-tablishing long-term client relationships [14], while the human feelings are single individual mental processes (include instinct, cognition, and affective images) that is not a simple principle to fully able in-terpret on knowledge that can be applied universally [15], the designers need to develop a scientific and quantifiable model for analyzing shapes as an important tool in the industrial design development processes to enhance the desirability of a product and influence consumer satisfaction in terms of perceived product quality [16].

Based on aforementioned problems, since product's basic func-tionality and quality are insufficient to meet customers' require-ments, challenge is faced by the companies today as the similar function of products has failed to be the winning criteria in the in-dustry. The product development nowadays relies on consumers' preferences, opinion and evaluation [17]-[18], therefore, this study con-duct and carries out the investigation related to customer preferences against the car design. Automobile use has strongly increased in Malaysia due to 75 percent of the adult population nowadays want go somewhere by a car.

In order to fit the products to each individual consumer and sat-isfy them through their feeling, Kansei Engineering related to emo-tional design has been proposed [19]. "Kansei" is the word used to express the "feeling" of consumer towards the products [20]. On the other, Kansei Engineering as a translating technology as the cus-tomer feeling and product images are converted into design ele-ments [21]. Here, the reason to use Kansei Engineering, is due to its ability and method to capture the impression of customer towards the product. Specifically, since these expressions are nomally hid-den and thus the method used is to translate them into a more detail product specification [22].

Hence, this study explores the Kansei Engineering with Physi-ognomy approach is as a tool to investigate and measure the hidden expression of the customers. The basis

form of Physiognomy is by concluding the characters taken from features. Physiognomy, from the outer appearance of human (especially the face) is able to sum-maries a person's characteristic and personality [23]. Since the Physi-ognomy is a knowledge related to the hypothesis based upon the possibility refers to the appraisal of the individual's external appear-ance (i.e., the face contour and/ or shape, facial components), there are the knowledge of customer characters and/or identities connect-ed the product design preferences [24]. Thus, the purpose of this study is to find out what the customer characteristics based on physiog-nomy characteristics towards the emotional preferences (Kansei) on the car design features.

2. EXPERIMENTAL PROCEDURES

2.1 Participants
A participant in this survey is 171 individuals ranging age from 19 to 45 years and owning a car that agreed to participate in this research.

2.2 Procedures
Questionnaires were distributed by face to face and participants completed each of the questionnaires. Participants were fully debriefed on the aim of the study before required to complete a questionnaire. The whole session takes approximately 30 days to complete. This questionnaire has divided into 2 sections. A first section was asking participants to provide some demographic information regarding gender, age, occupation, education, and other characteristics. For second section, participants have to choose the Kansei word that represented their emotional on design of car (6 design) as shown in Figure 1. The participants filled out the questionnaire in as much as time as needed. All respondents finished the task within ten minutes. Picture of each faces of respondents has been captured to interpret in order to get the characteristic. Response rate in this study is 68 % due to 171 questionnaire was accepted from 250 questionnaire that been distributed

2.3 Physiognomy Measures
Respondent's profile has been analyzed using Face Recognition software. This software required to locate 22 type of features (hair, head, eyebrow, eye, nose, mouth, jaw mustaches, beards, goatees, skin tone, eye lines, smile lines, mouth lines, chin lines, head wears, glasses, moles scars piercing and tattoos) to find individual's physiognomic of the characteristic and take a number that represent for each features which were then compared to preference data as shown in Figure 2.

2.4 Statistical Analysis
All statistical analysis was carried out with Statistical Package of Science (SPSS v.16.0). The analysis carried out the correlation between the emotional of the design profile

(Kansei) and Physiognomy characteristics. These correlations are to determine the strength of the assessment the variables[25]. To ensure that the statistical data acquired using the questionnaire in this study exhibited satisfactory reliability, a reliability analysis of the data was conducted to determine the Cronbach's α value. Cronbach's α of between 0.65 and 0.70 indicates moderate reliability, and that a Cronbach's α of between 0.70 and 0.80 entails high reliability [26].

MPV CAR

Figure 1: MPV car in the front, side and rear view were shown to respondent for each design
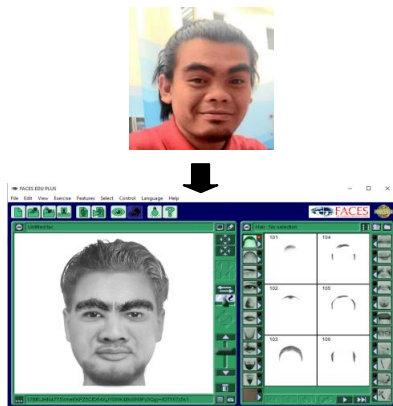

Figure 2: Face identification and interpretation

3. EXPERIMENTAL RESULTS

3.1 Analysis of Kansei Words Preferences

There are 6 types of car selected and used in the questionnaires. How to determine the highest design profile towards Kansei words (that represent the design profile based on customer's preferences), this section will describe the values distribution of 6 Kansei words based on the most and less preferences cars in the eyes of by customers.

3.1.1 Front View

The highest Kansei Word Stylish rated by respondents are fair for Renault Espace and Toyota Alphard Vellfire. For Kansei Word Comfortable and Safe have same highest chosen for Toyota Alphard Velfire but different for second chosen which Renault Espace and Nissan Elgrand each. Meanwhile, for Kansei word Sporty and Luxury, the highest is from Renault

Espace and second is Toyota Alphard Vellfire. Thus, the higher rating for MPV Front is for Toyota Alphard Vellfire as in Table 1.

Table 1: Front View Car Preferences of MPV Car

	MPV CAR - FRONT				
	STYL	COM	SAFE	SPO	LUX
Kia Carens	3.8	4.0	4.0	3.7	3.9
Honda Odyssey	4.0	4.3	4.1	4.0	4.2
Renault Espace	4.2	4.4	4.3	4.1	4.5
Fiat Freemont	4.0	4.3	4.2	3.7	4.0
Nissan Elgrand	4.0	4.3	4.3	3.9	4.2
Toyota Alphard Vellfire	4.2	4.7	4.6	4.0	4.3

3.1.2 Side View

The highest Kansei Word Stylish and Sporty, are for Kia Carens but different for the second chosen which is Toyota Alphard Vellfire and Renault Espace each. Comfortable, Safe and Luxury rated by respondents are same for the highest Toyota Alphard Vellfire. Then, for the second chosen for Comfortable is Nissan Elgrand, for Safe is Renault Espace and for Luxury is Kia Carens. Meanwhile, for Kansei word Sporty, the highest is from Kia Carens and second is Renault Espace. Thus, the higher rating for MPV Side is for Toyota Alphard Vellfire as in Table 2

Table 2: Side View Car Preferences of MPV Car

	MPV CAR - SIDE				
	STYL	COM	SAFE	SPO	LUX
Kia Carens	4.3	4.2	4.2	4.3	4.3
Honda Odyssey	3.9	4.2	4.1	3.6	3.9
Renault Espace	4.1	4.4	4.4	4.1	4.1
Fiat Freemont	3.8	4.1	4.2	3.7	3.9
Nissan Elgrand	3.9	4.5	4.3	3.8	4.2
Toyota Alphard Vellfire	4.2	4.6	4.5	3.9	4.4

3.1.3 Rear View

The highest Kansei Word Stylish, Safe, and Luxury rated by respondents are same for Fiat Freemont and for the second chosen is Toyota Alphard Vellfire. For Kansei Word Comfortable the highest chosen is Toyota Alphard Velfire and second is Fiat Freemont. Meanwhile, for Kansei word Sporty, the highest is from Fiat Freemont and second is Renault Espace. Thus, the higher rating for MPV Rear is for Fiat Freemont as in Table 3.

Table 3: Rear View Car Preferences of MPV Car

	STYL	COM	SAFE	SPO	LUX
MPV CAR - REAR					
Kia Carens	3.8	3.9	3.8	3.8	3.9
Honda Odyssey	3.6	3.9	3.9	3.5	3.7
Renault Espace	4.0	4.3	4.2	4.0	4.1
Fiat Freemont	4.3	4.4	4.4	4.3	4.5
Nissan Elgrand	3.5	4.1	4.1	3.3	3.6
Toyota Alphard Vellfire	4.1	4.6	4.4	3.8	4.3

3.2 Correlation Analysis

3.2.1 Front View

For the MPV Front View, the correlation significant towards car design is Front View 6 (Toyota Alphard Vellfire), where influenced by eye, mouth, jaw shape, hair and forehead. But mouth has been chosen due to fulfilled four Kansei word (Stylish, Comfortable, Safety, and Luxury) compared to others as in Table 4.

Table 4: MPV Car Front View versus Kansei Words and Physiognomic Characteristics

Correlation	Eye	Mouth	Jaw Shape	Hair	Fore Head
MPVF6Sty		.259(**)			
MPVF6Com	.217(**)	.294(**)			
MPVF6Safe		.286(**)		-.259(**)	
MPVF6Spo			.264(**)		.284(**)
MPVF6Lux		.252(**)			-.258(*)

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

3.2.2 Side View

For the MPV Side View Car, the most correlation happened at Side View Car 4 (Fiat Freemont) which is nose. While Side View Car 4 also have correlation for beards, jaw shape, hair and fore head but these characteristic was not selected because correlation only meet two or three Kansei word while nose meet all the Kansei words with Stylish, Comfortable, Safety, Sporty and Luxury as in Table 5.

Table 5: MPV Car Side View versus Kansei Words and Physiognomic Characteristic

Correlation	Beards	Nose	Jaw Shape	Hair	Fore Head
MPVS4Sty		.321(**)			.255(**)
MPV S4Com		.310(**)	-.244(**)		
MPV S4Safe		.277(**)		-.248(*)	
MPV S4Spo	.259(**)	.268(**)	-.236(**)	-.267(*)	
MPV S4Lux		.306(**)	-.261(**)		

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

3.2.3 Rear View

Table 6 shows the relationship of Rear View MPV car design towards physiognomic characteristic. Based on the correlation, the project found that Rear View MPV Car 4 (Fiat Freemont) has most correlation significant toward mouth and nose with represent three Kansei words respectively. While jaw shape, hair and fore head was not selected because are less correlation towards the Kansei Word compared to mouth and nose.

Table 6: MPV Car Rear View versus Kansei Words and Physiognomic Characteristics

Correlation	Mouth	Nose	Jaw Shape	Hair	Fore Head
MPVR4Sty				-.231(*)	
MPV R4Com		.239(**)			
MPV R4Safe	.287(**)	.266(**)			
MPV R4Spo	.249(**)	.287(**)	.292(**)		.254(**)
MPV R4Lux	.280(**)	.337(**)			

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

3.2.4 Demography

Table 7 shows the relationship of demography towards physiognomic characteristics. Based on the demography, the project found most of them have strong correlation significant toward mouth, mustaches and forehead. While educational doesn't have any correlation towards these characteristics.

Table 7: Correlation analysis of Demography towards Physiognomic Characteristic

Correlation	Eye	Mouth	Jaw Shape	Mustaches	Fore Head
Gender				-.595(**)	-.235(**)
Age	.217(**)	.255(**)	.219(**)	.186(*)	.251(**)
Occupation		.276(**)		.233(**)	
Education					
Annual Income		.259(**)		.163(*)	.200(**)
Current Car Owned	.247(**)	.178(*)		.165(*)	.181(*)
Car Preferences				.152(*)	.179(*)
Current Car	.167(*)	.254(**)	.212(**)	.262(**)	.289(**)
Car Producer		-.157(*)		-.177(*)	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Based on these result, these preferences have the correlation almost all the Kansei Word provided. The results of the present study exhibited high reliability due to the Cronbach's α value to be 0.962 as shown in Table 8.

Table 8: Statistic of reliability

Cronbach's alpha	Number of items
0.962	123

4. CONCLUSION

Based on above information, the study found that Toyota Alphard Vellfire, Renault Espace, Kia Carens and Fiat Freemont is the most preference design by customer. While for the correlation analysis, Front Views of for MPV car types (Toyota Alphard Vellfire) has strong the correlation with customers' Mouth, while Side View (Fiat Freemont) and Rear View (Fiat Freemont) have significant correlation towards nose and mouth respectively. Based on these finding, the study concluded that the CAR Product launched in Malaysia have strong correlation with Malaysian customers' physiognomy. Thus, this study expects that the preferences of product design can be predicted through the identification of physiognomic characteristics. Besides that, based on physiognomic identity, the characteristics of new product development based on design profiling can be generated to ensure the successful of product in the market based on customer preferences.

ACKNOWLEDGEMENT

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