

ADAPTATION OF SEMANTIC EMOTIONAL WORD'S SCRUTINY TOWARDS PRODUCT DEVELOPMENT: SPECTACLES

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Abstract— This study highlights the adaptation of SD Emotional Word in the integrative framework of the product development (Syaifoelida et al., 2014). Kansei Engineering (KE) used is related to emotional needs of consumers towards a product. Through the survey conducted using the questionnaires developed 5 Kansei Words (i.e. Boring-Attractive (B/A), Common-Unique(C/U), Lame-Cool (L/C), Classic-Modern(C/M), Fragile-Robust (F/R), and the preference scale (between Dislike to Strongly Like), we use the design of spectacle product as a case study to justify the part of development in the integration framework proposed. The survey is distributed to 1000 students in higher education public institutions in Melaka, Malaysia. In this study, by the mathematical decision approach, AHP, there are correlation existed between the customer emotional word and the design selected.

Index Terms— Kansei Words, Customer satisfaction, Product Developmet, Analytical Hierarchy Process (AHP), Emotional feeling.

I. INTRODUCTION

Nowadays, by increasingly competitive market condition, the providers or manufacturers have to carry out a customer-focused approach to their product development (design and process) as an articulation of what the expectation of customers. Ameri and Dutta, 2005 claimed that by increasing the complexity and variety of products to satisfy the increasingly sophisticated customers, they ultimately require the knowledge and expertise in developing products. This is be supported since the design quality is the degree to which a product design (specification) fits to customer needs and expectations, and conformance quality is the degree of match between the features of a specific product and its specification (Meirovich et al., 2007). So, to the design information transformed and accumulated is as very important in the developing a good product that has a stronger market competence.

First, the development process which led to a deeper understanding of how to gather and use information about the customer in the design, testing, launch, and management of new products can be optimized, and the improvement of the concurrent degree, product quality and cut development cost and time can be carried out in an effectual manner (Dahan and Hauser, 2001). Second, this also is due to that the customer purchases a product based on more subjective terms such as manufacturer image, brand image, reputation, design, and impression, although the products seem to be equal.

Therefore, this condition make the product design becoming more complex since they do not only have to meet the criteria of the customer satisfaction based on functionality of product, but also aesthetic of product based on emotional design. But how to

capture the emotional feeling of the customers towards the product design?

In order to grab the challenge is by adapting the first element in the integration framework (Syaifoelida et al., 2014) towards the quality attributes (as a construction of consumers' feeling). This is as part of Kansei Engineering in order to grasp the customers' affective needs in accurately and subsequently to the design products that match to their needs since it is, in reality, the subjective impressions are difficult to translate into verbal descriptions and emotional states that tend to be imprecise and ambiguous (Helander and Khalid, 2005).

II. THEORITICAL APPROACH

A. Kansei engineering for product

Kansei Engineering (KE) initially used as an ergonomic technology for capturing consumer psychological perceptions of product designs. Nagamachi (1995) defined Kansei Engineering as 'a translating technology of a user's feeling of the product into the design elements'. The term 'kansei' is a japanese word meaning the psychological feeling or experience people have in their minds (Nakada, 1997). Kansei is human subjective perception generated by interactions between organic functions and impressions and it also as an impression somebody gets from a certain artifact, environment or situation using all their senses of sight, hearing, feeling, smell, taste as well as their recognition (Nagamachi, 2001). Implementation of KE has been used at different point of the product development cycle where the sensible flexibility exists in the making decisions concerning to any design aspects of the product not only limited towards the product development. It also usables for the service product (Schutte et al., 2005).

B. The integration framework

As depicted in Figure 1, there are three major parts of the integrative framework proposed to capture the emotional feeling and level of satisfaction in product development. The first part consists of Semantic Differential (SD) Emotional Word Development (KE involved), the second part is the Functional Product Development (KM involved), while the third part is the Product Study Development. These three parts play as an important key to capture the elements of KE and Kano Method performed in the product development but the idea of translating the customer expression is only for part 1 (SD Emotional Word Development) is used (Figure 1:red highlighted).

Part 1: SD Emotional Word Development (KE involved)

In identifying what the needs of customers through their emotions, a process must be designed so that every word may be disclosed. In this section, there are two phases being concerned. Phase 1 is a 'Customer Emotional Word Exploration'. It is a process of how to collect the Kansei Word (KW) which the combination comes between the external collection (i.e. magazine) and the words articulated by users to the product design based on existing products. Finally, a database of new words is built and formed into a group of words (same meaning) and the major word chosen is selected as a word used for questionnaire developed. Phase 2 is 'Customer Emotional Word and Construction'. It is a process that involves the translation of the word in antonyms (opposite) and synonyms (real meaning), before every single Kansei word can be formed and expressed in the scale of Semantic Differential (Osgood et al., 1957).

C. Analytical hierarchy process (AHP)

AHP unites the personal judgment in a logical way which depends on the experiences and knowledge of the structure of modeling hierarchy, Saaty (1994). Analytic Hierarchy Process (AHP) is a methodology that very powerful and comprehensive that enables groups and individuals with the ability to connect the qualitative factors in the decision process. The AHP was developed by Saaty, 1980. According to Yoon

and Hwang (1995), such methodology is about the formalization of our intuitive understanding of a complex problem using a hierarchical structure. AHP uses a hierarchical model consisting of objectives, criteria (and some sub criteria) and alternatives for each issue or decision.

AHP is a multi-criteria decision-making technique (many criteria) which combines the quantitative and qualitative factors to sort the priorities, status, and evaluation of alternatives. In order to help the decision maker, there are nine point scale of importance between the two decision elements created (Saaty, 1996).

III. METHODOLOGY

In this study, the proposed integration framework is tested based on the hypotheses below in order to support the analysis conducted in the product development.

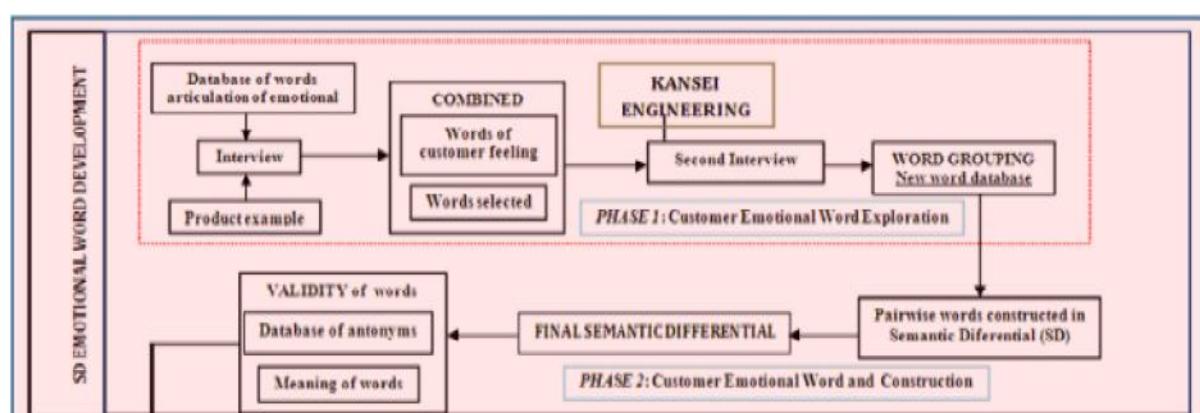
H₀: There are no existing correlation between the emotional feeling and design quality ($p < 0.05$)

H₁: There are any existing correlation appear between the emotional feeling and design quality ($p < 0.05$).

A. Selection of product domain

As a requirement of selection in product domain, a product (spectacles) is selected as a main part of a survey conducted among students in three public higher education institutions. A total of 1000 students are involved and covering gender of male, female and a variety of races. The spectacle is chosen because it is an important medium in the form of a lesson in class and also acts as one of products that are often used in student daily life and by assuming the rates of students' have experience wearing a spectacle or sunglass are 90%.

In spectacles, based on the existing product in market, there are three parts of spectacles with different designs proposed to the respondent (rims, lens and arms) (Figure 2). The six types of rim design that are used in the survey which are consisted of two types of lens that are rectangular and oval shape and three types of frames.



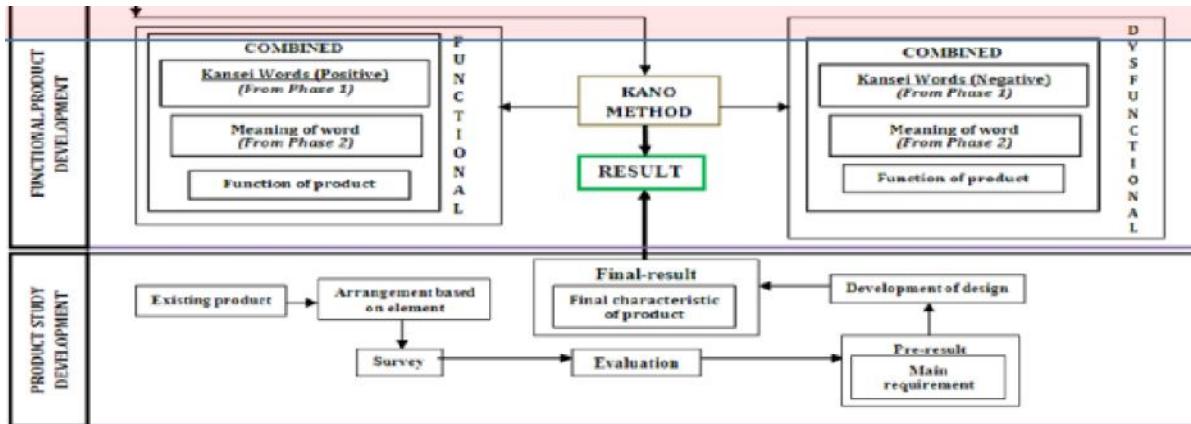


Figure 1.The integration framework of KE and KM in product development

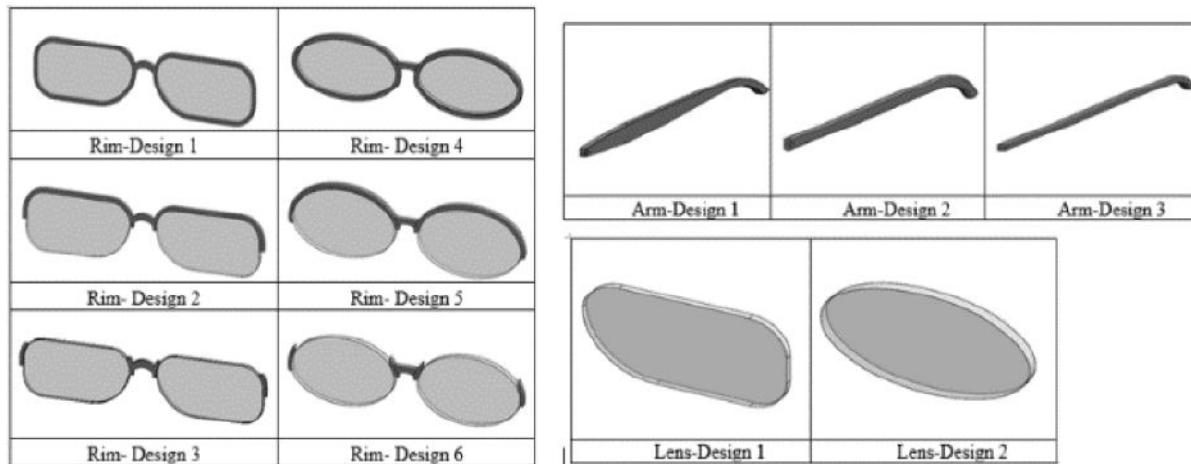


Figure 2: Three parts in spectacles

The rim types are based on fully rim, half rim and rimless. The respondents were asked to rate the preferences against the spectacles dimensional design and their Kansei Words that represent of each design (Figure 3).

Boring	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	Attractive
Common	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	Unique
Lame	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	Cool
Classic	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	Modern
Fragile	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	Robust
How much do you like this design?								
Strongly Dislike	<input type="checkbox"/> 1	<input type="checkbox"/> 2	<input type="checkbox"/> 3	<input type="checkbox"/> 4	<input type="checkbox"/> 5	<input type="checkbox"/> 6	<input checked="" type="checkbox"/> 7	Strongly Like

Figure 3: Kansei Words in Semantic Differential Scale

IV. RESULTS & DISCUSSION

A. SD Emotional word development

Phase 1: Customer Emotional Word development
The purpose of the interview is to catch random words that are usually used by every person to represent the spectacles. First, to list down the 48 different words that logically represent a spectacle as shown in table 1. Second, in the interview session, the respondents need to express their words to represent

their best feelings towards the design proposed and followed by the word grouping.

Table 1: Customer Emotional Word

Attractive	Rigid	Fragile	Durable
Uncomfortable	Comfortable	Unpleasant	Pleasant
Ugly	Beautiful	Feminine	Masculine
Unattractive	Attractive	Steady	Unsatisfied
Inconvenience	Convenience	Satisfied	Firm grip
Adorable	Stressful	Common	Different
Sweet	Neat	Spacious	Dazzling
Formal	Opaque	Not ergonomic	Ergonomic
Simple	Stylish	Formal	User friendly
Outdated	Modern	Low Quality	High Quality
Glamorous	Outstanding	Fitting	Sophisticated
Woman like	Man like	Emotional	Natural

Phase 2: Customer Emotional Word and Exploration
The words grouping done to reduce the number of selected words as much as possible for questionnaires developed. The grouping carried out is due to different word that may have a same meaning or represent the same thing. The word resulted from grouping will be used in the questionnaire of the survey. In addition, certain words that were stated by the respondents (contradict words), such as not beautiful-beautiful may not be selected as the main word. Figure 3 shows the pairwise words in the final

semantic differential based on final Kansei Words selected.

B. The preference design and the priority of Kansei words

The powerful method using Analytical Hierarchy Process (AHP) as a decision maker showed the most preference design towards three type of design in spectacle. Every Kansei Word was analyzed one by one in order to determine each particular word (Design Characteristic) that describing the preference parts of spectacles design. As advantage, the manufacturer can determine which characteristic are needed to be concentrated in order to create a better and an ideal spectacle design.

In rim design, the design no.1 (full of frame and rectangular shape), is the most preference towards the Kansei Words of ‘Attractive’ with the score is 475 out of 1000 of the respondents, the respondent agreed that the ‘Attractive’ is most factor that need to be first considered in designing of a rim in spectacle product. In the arm design, showed the most preference design is design no. 1 as well towards the Kansei Words of ‘Modern’ with the score is 600 out of 1000 of the respondents while in designing of lens in spectacle, the most preference is towards design no.1 (which is rectangular) towards the Kansei Wprds of ‘Modern’ with score of 904 over 1000 respondent. For both of design, the respondent agreed that the ‘Modern’ is most factor that need to be first considered in designing of a lens and arm in spectacle product.

Figure 4: Design preference of spectacle towards their Kansei Words

CONCLUSION

This study found that there are relationship existed between Kansei Words and Product design (There are any existing correlation appear between the emotional feeling and design quality ($p<0.05$)). This relationship is tested through one empirical studies (the adaptation of SD Emotional Word in the integration framework (Figure 1) towards the product used in our daily life. The result shows us that the emotional design or the Kansei response is impacted or influenced against the product design. The emotional feeling of ‘Modern’ and ‘Attractive’ should be given as a main priority in the spectacle product development because the relationship is existed towards all of the emotional design.

This study gives the useful spectrum to the others in order to gain more powerful product development in the future, and still on the customer satisfaction and requirement track. Further research should focus or more effort given towards on applying this integrated framework in order to evaluate, to access this relationship of customer emotional needs or requirement and product attributes in the other product development domain.

REFERENCES

- [1] C. E. Osgood, G. J. Suci, and P.H. Tannenbaum, “The Measurement of Meaning”, 9th ed. University of Illinois Press, 1957.
- [2] E. Dahan. And J.R. Hauser J.R., “Product Development – Managing a dispersed Process”, The Handbook of Marketing, MIT Sloan School of Management, 2001.
- [3] F. Ameri, and D. Dutta, “Product Lifecycle Management: Closing the Knowledge Loops. Computer-Aided Design and Applications”, Vol. 2, No. 5, pp.577-590, 2005.
- [4] F. Syaifoelida, S. H. Yahaya, H. Siombing, H., and M.Y. Yuhazri, “The Integration Framework of Kansei Engineering (KE) and Kano Method (KM) for Product Development,” Proceeding of the International Conference on Advances in Civil, Structural and Mechanical Engineering (ACSME), pp.30-3, Bangkok, Thailand,2014.
- [5] G. Helander, and H.M Khalid “Affective and Pleasurable Design”. In G. Salvendy (Ed.), Handbook of Human Factors and Ergonomics, 3rd Ed. New York: Wiley Interscience, 2005.
- [6] G. Meirovich, Y. Brender-Ilan, Y., and A. Meirovich, “Quality of Hospital Service: The Impact of Formalization and Decentralization”, International Journal of Health Care Quality Assurance, Vol. 20 No.3, pp.240-252, 2007.
- [7] M. Nagamachi, “Workshop 2 on Kansei Engineering”, Proceedings of International Conference on Affective Human Factors Design, 2001.
- [8] Nagamachi, M., “Kansei Engineering: a New Economic Consumer-Oriented Technology for Product Development”, International Journal of Industrial Ergonomics Vol.15, pp.3-15, 1995.
- [9] Nakada, “Kansei Engineering Research on the Design of Construction Machinery”, International Journal of Industrial Ergonomics 19, pp 129-146, 1997.
- [10] S. Schütte, and J. Eklund, “Affective Values of Lift Trucks - an Application of Kansei Engineering”, Proceedings of WMOD Conference. Italy, 2005.
- [11] T. L. Saaty, “Fundamentals of Decision Making”, RWS Publications, Pittsburgh, PA, 1994.
- [12] T.L. Saaty, “Decision Making for Leaders: The Analytical Hierarchy Process for Decisions in a Complex World”, The Analytical Hierarchy Process Series, Vol. 2, pp. 71-74, 1996.
- [13] T.L. Saaty, “The Analytic Hierarchy Process”, McGraw-Hill, New York, 1980.
- [14] Yoon, and C. L. Hwang, “Multi Attribute Decision Making – An Introduction”, Sage University Papers, Series/Number 07-104, Sage Publications, pp 59-66, 1995.

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