Cultural Difference on User’s Affection of Center fascia display in a Car

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Abstract
This study mainly aims to investigate the affection of automobile center fascia displays. To achieve this goal, 22 affective words were selected and an affective evaluation experiment was conducted on type-specific displays. A total of nine products with three display types, horizontal, vertical and mixed, were considered to the assessment of affection. Based on this, three different affective factors were extracted for each display type. After conducting an affective evaluation on nine products based on the affective factors, MDS was applied to analyze the dimensions of the affective factors and derive positioning map for each product. In addition, MANOVA was employed to verify the influence between nine products and affective factors, and to find out the difference in the significant affective factors between Korean and foreign groups. As a result, there was a difference of preference for Koreans and foreigners regarding display types. The horizontal type was significant for novelty and luxuriousness, the vertical type was significant for novelty, fanciness and overall preference, and the mixed type was significant for novelty and fanciness. The differentiation of the product was caused by an affection of novelty, fanciness and luxuriousness. This study is expected to provide strategic direction for overall affection in terms of car display types.

Keywords: Center fascia, Affective factor, Cultural difference

1. Introduction
Recently, cars have become a complex vehicle that meets the needs of various users and encompasses a variety of factors that affect vehicle design, not just manufacturing for simple means of movement [5][6]. As part of improving customer satisfaction, there is a way to improve affective quality by organizing affection [3], in fact research continues to improve the exterior and interior design of cars through kansei engineering [1][2].

In addition, as self-driving progresses, the amount of information exchanged between drivers and vehicles is increasing rapidly, and as a medium for information interaction, the car center fascia is becoming larger and more diverse in form. As the interior of the car is different by nationality [7][8], it should be designed considering the preferences of each nationality, however affective research on the shape of the center fascia is still lacking.

Although there have been many cases where customer affection has been reflected in the design of automotive interior package components, there is still a lack of research to match the new design trend of Center fascia. Considering customer sensitivity, a variety of materials, colors and shapes have been applied to the crash pad in some researches [4][9][10], and there was also a study that researched an affection of luxuriousness of the center fascia [12]. However, as the design dimensions like size and shape of center fascia display in a car are becoming diverse, the impact of the crash pad, which is that the center fascia research must be accompanied, on the customer's affection is increasing, so we will explore the affection of the center fascia by nationality.

2. Method
2.1 Research overview
Affective evaluation was conducted to investigate the affection of Koreans and foreigners to automobile center fascia displays. The first 184 affective words for use in affective evaluation were selected through literature and market research related to automobiles or displays. Among these words, overlapping or similar meanings were deleted or incorporated, and then removed some words, which is not directly related to the display panel or have not significant effects on visual affection, and 22 affective vocabulary words were finally selected by KJ method. The experiment was conducted in two stages, using Google Forms platform, through a mobile response-based survey.

In the 1st survey, nine products considering three display types were evaluated with an affective evaluation of 22 different words on the Likert 9 scale, and based on this, a factor analysis of the Veri-Max method was conducted. In the second survey, for nine products considering three display types, three affective factors for each display type derived through factor analysis were evaluated with the Likert 9 point scale. Through the evaluation results, MDS analysis was conducted to draw up a positioning map for the affective factors of each type of display, and through MANOVA analysis, the influence on the affective factors of each Korean, foreign group and product was analyzed.

The overall research flow is described as shown in Figure 1.
2.2 Participants

Participants in the first survey were composed of a total of 77 (50 men and 27 women), including 37 designers. The average age was 26.83 years old. In the second survey, a total of 161 people (61 males, 80 females; 80 Koreans, 61 foreigners) participated. The average age was 27.49 years old. All participants had no visual impairments, so there was no problem with participating in the experiment.

2.3 Experimental alternatives

The alternatives used in the 1st and 2nd surveys consist of three horizontal, three vertical, and three mixed models considering display types, such as Table 1. They are selected by considering European, Asian, and U.S. brands.

Table 1. Experimental Alternatives for each type of display

| Type of Display | Experimental Alternatives |
|-----------------|---------------------------|
| Horizontal      | Product A | Product B | Product C |
| Vertical        |            |            |           |
| Mixed           |            |            |           |

Figure 2. MDS positioning maps by nationality for horizontal display type (Comprehensive/foreign/Korean)

Figure 3. MDS positioning maps by nationality for vertical display type (Comprehensive/foreign/Korean)
3. Results

According to the results of the survey by display type, the horizontal type has been derived from the elements of luxuriousness, harmony, novelty, and the vertical and mixed type has been derived from the elements of harmony, novelty, fanciness respectively. For horizontal types, foreigners preferred Product A, but Koreans preferred Product C, for vertical types, foreigners preferred Product A, but Koreans preferred Product B, and for mixed types, foreigners preferred Product A, but Koreans preferred Product C. The influence of nationality existed in all types, and some affective factors for each type of product also appeared to be influential.

The first result of the survey has been proceeded to remove factors that were less common or were double loaded by performing factor analysis. In the case of horizontal type, 7 affective words were represented as luxuriousness, 6 affective words were represented as harmony, 3 affective words were represented as novelty. In the vertical type, 6 affective words were represented as harmony, 4 affective words were shown as novelty, 2 affective words were shown as fanciness. Finally, in mixed type, 6 affective words were represented as harmony, 5 affective words were represented as novelty, 3 affective words were shown as fanciness. Three affective factors were derived for each type.

After that the MDS analysis using the results of the second survey showed that product A is the most preferred product for horizontal models, as shown in Figure 2, Koreans tend to think that harmony, novelty, luxuriousness affections have strong positive correlation with the overall preference, prefer product C the most, and foreigners, having a tendency that each affection has weak positive correlation with the overall preference, prefer product A the most.

According to the analysis of MANOVA by type for the second survey result, the product and nationality variables were all significant. For horizontal types, the affection of novelty and luxuriousness were significant between products and the affection of harmony, novelty, luxuriousness, and overall preference were significant between nationalities. For vertical types, the affection of novelty, fanciness, and overall preference were significant between products and the affection of harmony, novelty, fanciness, and overall preference were significant between nationalities. For mixed types, the affection of novelty, and fanciness were significant between products and the affection of harmony, novelty, fanciness, and overall preference were significant between nationalities. Examples of MANOVA analysis results are as shown in Table 2.

| Display Type | factor        | df | F     | p-value |
|--------------|---------------|----|-------|---------|
| Horizontal   | Harmony       | 2  | 0.567 | 0.568   |
|              | Novelty       | 2  | 9.458 | <0.001  |
|              | Luxuriousness | 2  | 7.225 | 0.001   |
|              | Overall preference | 2 | 0.838 | 0.434   |
| Vertical     | Harmony       | 1  | 11.801| <0.001  |
|              | Novelty       | 1  | 34.063| <0.001  |
|              | Luxuriousness | 1  | 7.871 | 0.005   |
|              | Overall preference | 1 | 4.844 | 0.028   |

Figure 5. An affective impact diagram by nationality of horizontal display type
4. Discussion and Conclusion

Automobiles are no longer just a means of transportation, but a core product that should reflect a variety of user experiences. Among them, the customer's affection to crash pads in the car as the central fascia display expands is affected by the shape and structure of the central fascia display, and the contribution of this study is to investigate the user affection of each nationality to the center fascia display in line with these technology trends.

In the previous studies, researchers have been investigating the overall affection of the crash pad or the affection of the function-oriented center fascia, such as air conditioning buttons and air-vented areas [10][11][12], however as issues regarding expansion of center-fascia display were not considered, there was a limit to understanding emotions about image of crash pad as a whole. In addition, unlike this study, national sensitivities for each product are not considered for each display type. Research shows that the user's affection to the car center fascia display varies depending on the type and nationality of the display, so future design direction is expected to be produced considering the type and nationality of the display.

In overall, this study shows that harmony and overall preference are not significant, and that a affection of novelty, fanciness, and luxuriousness are significant. With these results we can interpret that the harmony and overall preference are similar because each product is more than a certain level in common, and the differences in products are derived from novelty, fanciness, and luxuriousness. Therefore, it would be important to study the affection of meeting product market targets without significantly deviating from comprehensive preference rather than identifying the absolute superiority between products. The limitations of this study are that each product has a variety of variables that makes it difficult for users to analyze the exact cause of the affection of the product. Therefore, in the future, the research scope will be further elaborated to carry out affective research based on the relevance of design specifications.

The result of this research is expected to help the user study the affection of automobile center fascia displays in the future by identifying the users' affective factors about display types and nationality, and figuring out how each affective factor affects comprehensive preference.

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