CAR STYLE RECOGNITION 1990-2010

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ABSTRACT

The aim of this research is to identify the user recognition towards the car style in the market line up. To study the car style line up, a certain duration of the period that can show the car style changes need to be observed. It is due to a car style changes happen at least within a year or more. This research will support the designer in their quite long time of design development process. The survey one (I) was done to observe the changes of car form in a series. 155 types of Japanese 2-box car with 248 models, which released in the mass-production from 1990 until 2010, were selected as the samples. Twenty types of ratios based on the car specifications and basic scales were collected and analyzed by Principal Component Analysis (PCA). The result of the survey one (I) showed that the first until seventh components with 76.13 % of cumulative percentage of the total variance explain were taken for further analysis. Two-box car style changes are towards the improvement on efficiency of space usage. The car style is towards cubical, and the A-pillar position is moving to the front of car engine area. Then, the survey two (II) was done to get the user evaluation towards the car style changes. Ten Japanese who are in 20 to 25 years old were chosen as the respondents. Collected data was analyzed by MDS (Multidimensional Scaling) and Cluster analysis. Four kinds of groups were identified, which were ‘long body’, ‘wagon’, ‘high and long body’ and ‘high and box’. The results from both surveys were analyzed in detail. The user recognized the car style direction similar with the actual car style changes in the market line up. The user recognition on the car style has a similar direction towards the actual car style changes that released in the market.

Keywords: User recognition, Car style

INTRODUCTION

In order to enhance effective decision-making in car design development, it is a need to grasp the previous car style changes direction. Nonetheless, it is difficult to grasp the car style changes due to its wider and diversities areas. Therefore, one of the considerations is by observing the rational understanding on the car package measurement. The decision on car package can lead to the selection on car styling [1][2]. Car package varieties are base on the certain selected ratio of its height, width and length.

As the user is the end target for the car, their recognition towards the car style changes needs to be identified as well. To what extent the user response to the car style changes is the question. By identify this, it can be one of the ways to improve the car design strategy in its development process.

RESEARCH AIM

The research aim to study the relationship between observations based on the car style released in market and user evaluation on car style changes.

BACKGROUND AND PAST STUDY

Due to the observation on the car style changes is quite complicated, there are several analysis ideas and methods based from past researches that are need to be considered as explained below:

Duration of Series in Car Changes Validation

There are very few studies on the car style changes that are based on the car package measurement. In 1982, Hamada Shinji did the first study on the changes of car style that can be obtained by car proportion including the car specification and basic scale [3]. In 1992, Furuya Shigeru studied on similar aspects as Hamada Shinji did, with the gap of ten years from previous research [4]. As the car developments process has a quite long duration, which sometimes can be up to 3 or 5 years, depend on the changes of the situation and criteria, there is no need a frequent study on this matter. Certain long period is needed to forecast on the car style changes pattern as support knowledge for designer during the design development process. In relation, the studies on the car style changes are need to be done from time to time. Research on recent car style changes has not been done yet, and it remains as a question.

Diversities on the car style variations

Car styles are categorize into 2-box or 3-box type. Each car style keeps changes whether it is a minor or major changes. Diversities in car style contributed to the complication in this study. Therefore, to get the potential car style changes direction, the suitable scale of the target sample and method is a need. In past research, the studies on 2-box and 3-box car are done together [4-5]. However, the most appropriate way is by doing studies separately between 2-box, and 3-box car due to both car style is very different. The study on style changes on 2-box car as the sample has not been done yet.

Series of 2-box car style

Recently, 2-box car has varieties of style and its production also was increasing by years. Upon 155 of 2-box cars, there were 28, 95 and 124 models produced in 1980-1990, 1990-2000 and 200-2010 respectively. By studies on the 2-box car style changes, which based on the car package measurement there might be a certain kind of potential direction of the 2-box car style changes that can be grasped.

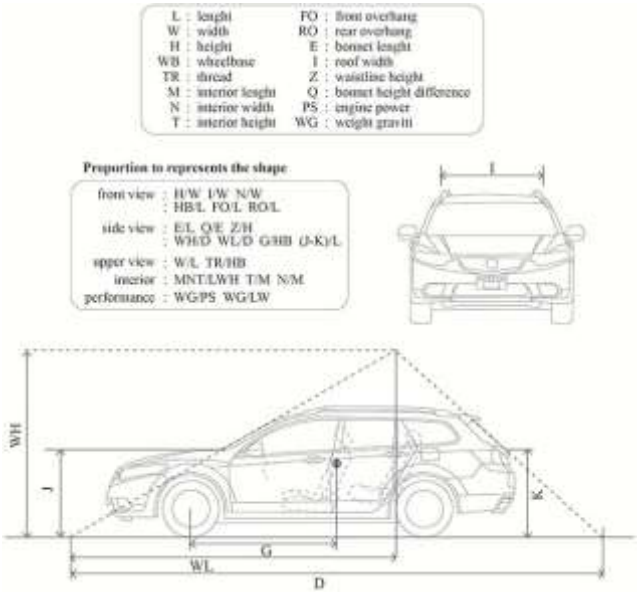
Positioning of 2-Box Car in Development Process

From 1970 until in the middle of 1980, 3-box car style has high priority in the car design development compared to the 2-box car style. In the middle of 1980, the 2-box car style is getting its positioning continuously to have its exclusive body style. There are the periods of time that the 2-box body style development aroused from the 3-box body style. In some conditions, 3-box body styles were aroused from the 2-box body style as well. It is easy to categorize the 3-box car because it shape does not have drastic changes. However, it is difficult to categorize the 2-box car due to car purpose, style and space usage is varieties. Therefore, a study on the 2-box car style changes is needed in order to observe the series of its current style direction and also to forecast its future style direction.

SURVEY ONE (I): Studies on style changes by car line-up evaluation

In order to achieve the research aims, two kinds of surveys were applied to this research. The first survey was the observation on the car style changes by car line-up evaluation. The next survey was on the car style changes by user evaluation.

Figure 1 Measurement of car basic specification



Selection of the survey sample

155 of 2-box cars name with 248 models that released in the market from 1990 until 2010 were chosen to be the samples of this research [8]. The small car and business car were not included to be the research samples.

Analysis method

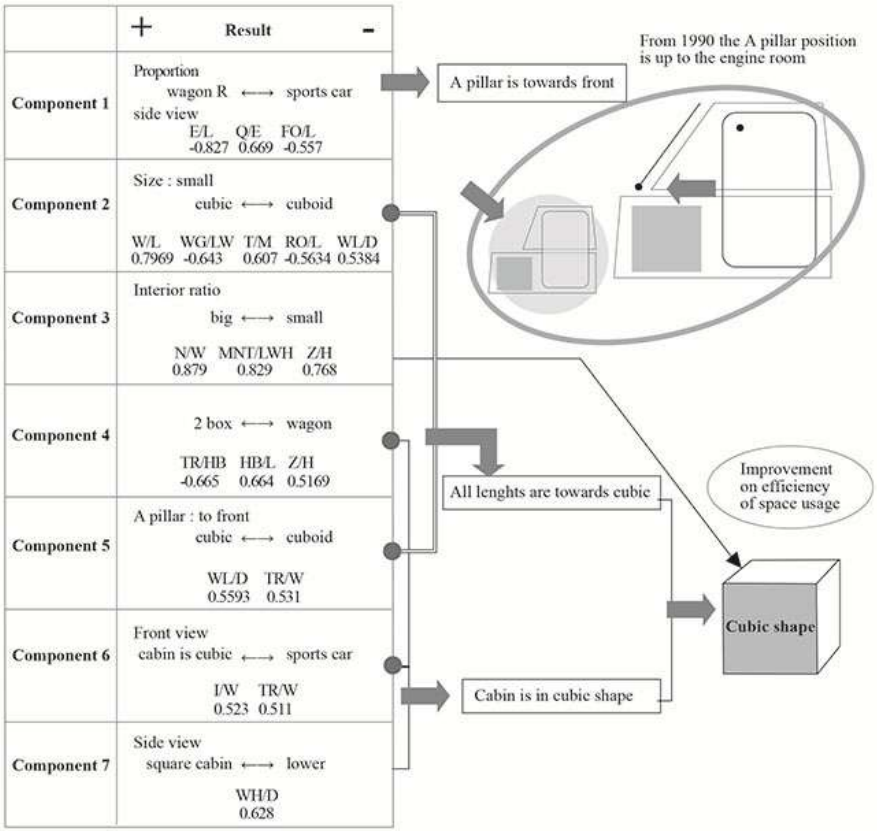
The method of this study based on the past researches on car style changes. The research samples were selected from 2-box car style with 20 kinds of different ratios. The ratios have five kinds of categories. Four ratios of the car front view, 11 ratios of the

car side view, two ratios of the car upper view, two ratios of interior and two ratios of car performance (figure 1). Data collected was analyzed by PCA. Based on the matrix of component pattern, further analyze was done on each component by comparing its positive and negative direction.

Survey result

The component matrix of 1 to 7 (figure 2) was chosen with the cumulative percentage of the total variance explain was 76.13% that the characteristic value is more than 1. The scree plot eigenvalue showed that there are drastic changes from component 1 to 7. The value of pattern matrix range was more than 0.4.

Figure 2 Analysis result of component 1-7



There are six kinds of ratio variables categorized into two classifications: front view and side view. For front view, the ratios are height to weight (H/W) and rear overhang to lenght (RO/L). For side view, the ratios are bonnet lenght to lenght (E/L), bonnet height to bonnet lenght (Q/E) and waistline height to height (Z/H). For H/W, the results showed that the height over width is whether the vehicle has a high or lower body. RO/L showed that rear over lenght is whether the car is long or short. For a side view, E/L showed that the bonnet length is long or short. Q/E is whether the bonnet height has a big or small degree of slanting. Z/H concerns whether the waistline is high or low. Wheelbase is either long or short.

Each ratio explained in two directions: positive or negative. The direction based on total directions of all variables. For example, if there are even numbers of positive (+) variables, then the total direction take positive (+) as an answer. In relation, if there are odd numbers of negative (-) variables in the group, then the total direction take negative (-) as an answer.

A detailed explanation is provided only for component 1. Component 1 has a higher cumulative percentage, which is 17.4%. Potential variables for ratios are E/L, Q/E, and FO/L. E/L ratio is for bonnet length (E) over the length (L), which is -0.827. These variables show the side-view proportion. Q/E ratio is for bonnet height difference (Q) over bonnet length (E), which is 0.669. These variables also show the side-view proportion. Lastly, the FO/L ratio is for front overhang (FO) over the length (L), which is -0.557.

Variable ratios are E/L at -0.827, Q/E at 0.669, and FO/L at -0.557. The overall direction of component 1 is towards positive (+) while the side view is towards the wagon proportion. A similar analysis was done for components 2 through 7 as shown in Figure 2.

Result of Survey I

In this section, an explanation on overall positive and negative result of each component was done to observe the overall car style changes (figure 2). The car style divided into three kinds of categories, which seem to show the same directions toward all of the components.

For the component 1, the car style changes whether to be the wagon R proportion or the sports car proportion. In detail, it had relation with the A-pillar situation whether it move to the engine room or not. As the direction was positive (+), the car style was towards wagon R proportion. Recent 2-box car showed that the A-pillar position is up to the engine room as well, contributes to a spacious interior.

For components 2 and 5, the style can be seen as all length is whether its car style is towards the cubic or cuboid. The direction was positive (+), which towards the cubic. Components 4, 6 and 7 have a similar positive (+) direction. All these components showed that the car cabin was towards a cubic shape. Overall, it can be said that the car style changes is towards the improvement on efficiency of space usage.

SURVEY TWO (II): Car style changes direction by user evaluation

Research aim

This study aims to get the car style changes direction by the recognition on a knowledge of user evaluation towards the car style. User's perception towards a product understood by studies on the structure of internal information in human memory. For example, the judgment on the similarity of any products can be analyzed by MDS. In other words, this survey aims to observe the intimacy image among car styles. The psychology position relation among the product expressed in the perceptual map showed by the classification in intimacy category [9].

The result of this survey was then compared to the survey I to check the similarity of the car style changes direction. The higher similarity between surveys, the higher possibility of knowledge recognition happens in user. This data is potential to check the overall car style changes direction.

Survey method and sample selection

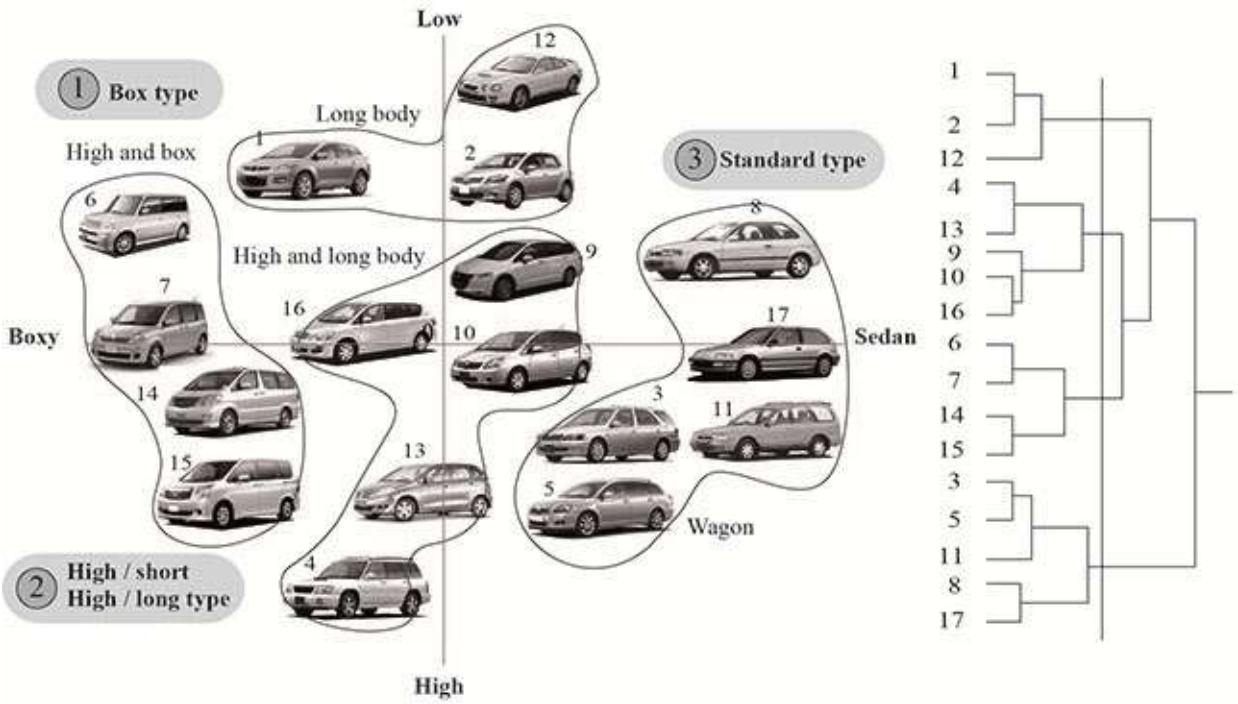
Seventeen kinds of cars were taken as the research sample. The samples were selected through s Seventeen kinds of cars selected as the research sample through several groups discussion of young Japanese. Ten male Japanese selected as the respondents because of their higher intention in car. 136 pairs of car samples were evaluated by five likert scales from 'totally similar' to 'totally different'. For each respondent, data collected was arranged in square symmetric matrix in similarity ordered class and analyzed by MDS and Cluster analysis. S-stress graph was analyzed for the potential axis number. Further analyzation was done to the MDS map as well.

Result of Survey II

The car trend analysis was done on the judgment of its style image among respondent group. Two axis were identified in the MDS map, which were 'boxy-sedan' and 'low-high' (Figure 3). Four kinds of groups were categorized, namely 'high and boxy', 'long body', 'high and long body' and 'wagon'. For a group of high and box, the cars were grouped based on boxy car body. The group of the long body was organized based on body length. The group of high and long body reflects the cars with the vast interior. Wagon group was organized based on its shape.

Three kinds of directions of car styles were observed. These included 'box type', high and or short/long' and 'standard'. It showed that the user also recognized the car style changes through their experience and observation in daily life.

Figure 3 Mds map for car styles

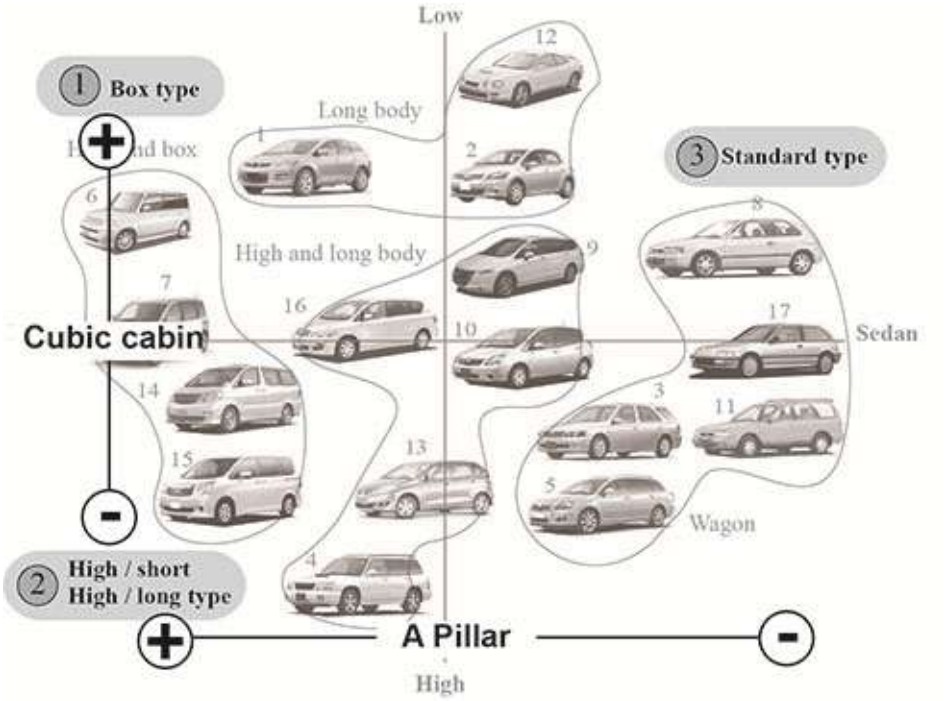


CONCLUSION

Survey I showed three kinds of car style directions. The directions were the A-pillar position moved to the car engine area, most of the lenght of the car showed a cubic shape, and the car cabin was a cubic shape. It can be concluded that the car style direction was towards the cubic shape with a spacious interior. Survey II observed the three kinds of car style directions namely box type, high or short/long type, and standard type.

The changes of the A-pillar and size of the cabin were the main aspects that lead to the car style direction (Figure 4). Similar direction of results was obtained between both surveys. In other words, the user recognized the car style changes, which similar with the actual car style changes in market line-up.Therefore, by observation on user perception to trends, the potential structure of a product trend direction can be determined.

Figure 4 Car style changes direction



The new car design development process takes several years to complete. During that period, the trends of products e.g. car changes depending on user needs and demands. Designer was sometimes having difficulty to catch-up the car trends direction. Therefore, this research will help the designer to observe the product trend by studies on the structure of user perception. In relation, it will contribute to the improvement in the initial strategy for design development to increase the user buying behavior towards car.

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