

The Influence of Proportion Preference in Automotive Design: Comparison Between Japanese and German Automobiles

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Abstract

The purpose of this study is to reveal concrete evidence on how aesthetic preference is applied in product design by countries. Since the 19th century, the proportion has been examined various times, and the conclusions consistently showed the strong preference for the golden ratio (1:1.618). However, previous studies are mainly focused on western products that were designed by western designers, so when the same experiment conducted for the first time in Asia with the question of ‘Is the Asian subjects also likes the golden ratio?’, the result clearly revealed that Korean subjects have a significant preference for the root ratio (1:1.414) and perfect square (1:1). It demonstrates that proportion preference might be different by countries, and it also influences on everyday products. Moreover, there is not enough evidence of Asian product proportions. For this reason, this study will strive to expand the knowledge on Asian aesthetic preference by focusing on Japanese automobiles that were designed and produced in Japan. 55 iconic Japanese automobiles were analyzed for proportion and compared with 50 iconic German automobiles. The result shows that Japanese automobiles have a shorter length of 7:10 (1:1.414) ratio than German automobiles with 13:23 (1:1.769) ratio. This result proves that there is the difference in preference for the proportion of Japan and Germany, and it has already influenced on automobile proportions. This result has a strong value that finding the most appropriate proportion of automotive design is a major issue in new product development, so this can be adapted to various fields of the design process where strong cultural value exists.

Key words: Aesthetic Preference, Automobiles, Product Design, Proportion Analysis

1. Introduction

Proportion pertains the initial impression of a product and creates its intrinsic design identity (Bloch, 1995). The impression of a product is becoming more relevant considerations in product design, as modern society is turning more sensitive to manifest an individual identity into an impression of product form (Coglianese, 2000).

This perspective gives an idea that the product proportion is a valuable element to build a pleasing design form.

1.1. Proportion Analysis of Automobiles

The balance and harmony of a product are influenced by proportions becoming the comfortable arrangement of things in design (Gerald, 2011). These visual aesthetics

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create pleasing product shapes and styles, as proportion is a significant design element in automobiles, appliances, and other product designs (Yamamoto & Lambert, 1994). Accordingly, it is mandatory that a designer needs to know what defines an aesthetically pleasing design. The pleasing design formed by design principles that involves the parts of a visual display (Veryzer, 1993), it the first step of a designer to establish an idea, because it is the part of an essential formation of aesthetic responses (Lewicki, 1986). Such steps can be observed when an automobile designer uses the size of the car wheel to create a space to decide on the length of the car. The size relationship of the design plays a fundamental part of the design principle of creating proportions. Therefore, this study will explore the topic of proportions and underline in how certain proportions are applied in automobiles in the different cultural background, by focusing on Japanese automobiles and comparing with German automobiles.

1.2. Golden Ratio and Automotive Design

When a designer sketches a car, for the first step, the proportion of automotive body is composed of size and space, because the proportion is the major characteristic of automotive design. For this reason, the majority of automobile designers strive to find the most appropriate proportion for the first step of their design process. In the history of automobile design, the golden ratio has been an essential design element as observed in many proportion analysis like Volkswagen Beetle.

It was one of the most popular cars in the Western society. Fig. 1 shows the outline of the Beetle fits

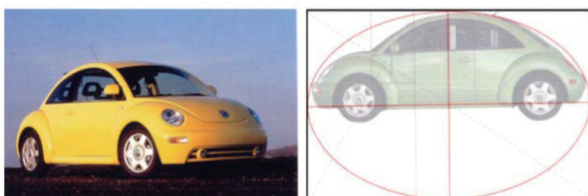


Fig. 1. Analysis of Volkswagen Beetle with golden ratio

perfectly to the ellipse of the golden ratio rectangle. Its major horizontal axis also perfectly fits with the car's bottom, and vertical axis across the middle of the car (Elem, 2001). It illustrates that the golden ratio applied to the iconic automobiles, and there are many examples of this representative case like Porsche 911 Carrera GTS and so on.

1.3. Preference Proportion - Golden Ratio

Historically, proportions have been examined starting with Gustav Fechner's experiment on preference proportion in 1876. The main focus of Fechner experiment is to find out which kind of proportion the participants like the most (Fig. 2). Since the 19th century, Fechner's experiment has been repeated various times in many western countries with different methods or stimuli, for example in Germany, U.S.A, France, U.k, Canada (Lalo, 1908; Thorndike, 1917; Weber, 1931; Thompson, 1946; Nienstedt, 1951; Eysenck, 1968; Berlyne, 1970; Godkewitsch, 1974; Piehl, 1978; Green, 1995; Högh, 1997), and the conclusions have been consistent resulting in the preference of the golden ratio. However, When Jung conducted Gustav Fechner's experiment for the first time in Asia (2006 & 2012), it has shown a different result (Jung & Badke-Schaub, 2017). By analyzing Korean subject's preference and their traditional products (Fig. 3), the result clearly showed that the most preferred ratio was not the golden ratio 5:8 (1:1.618), but root ratio 7:10 (1:1.414) and perfect square (1:1) in South Korea.

This conflicting result raised doubt on the universal likeness of the golden ratio. Because, previous studies are mainly focused on western products that were designed by western designers, and there have no enough studies on the preference of the golden ratio in Asian countries, and it also aroused a question whether other Asian countries, for example, Japan, have a similar preference like South Korea or not. Because Japanese design was a major influence on the establishment and definition of modern design. Even today Japan nurtures

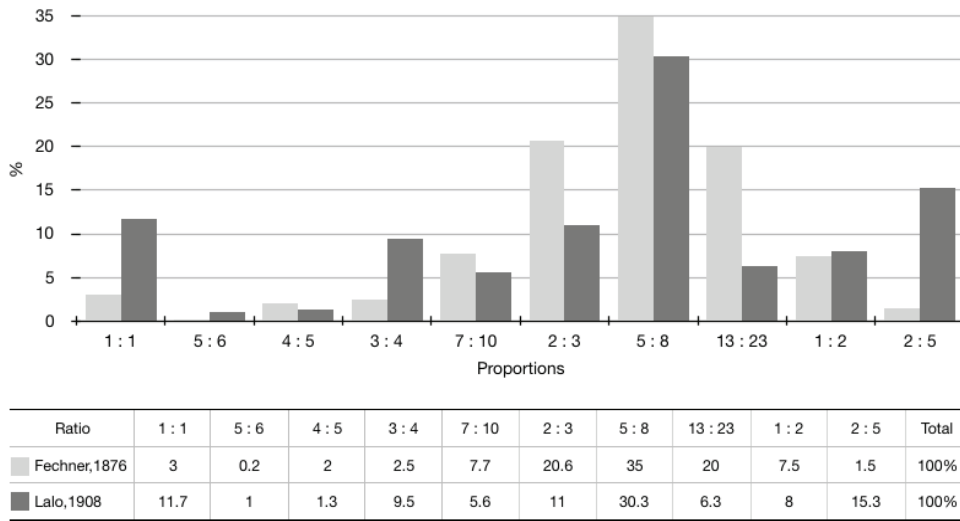


Fig. 2. Most preferred proportion of Fechner and Lalo's experiment (Elem, 2001)

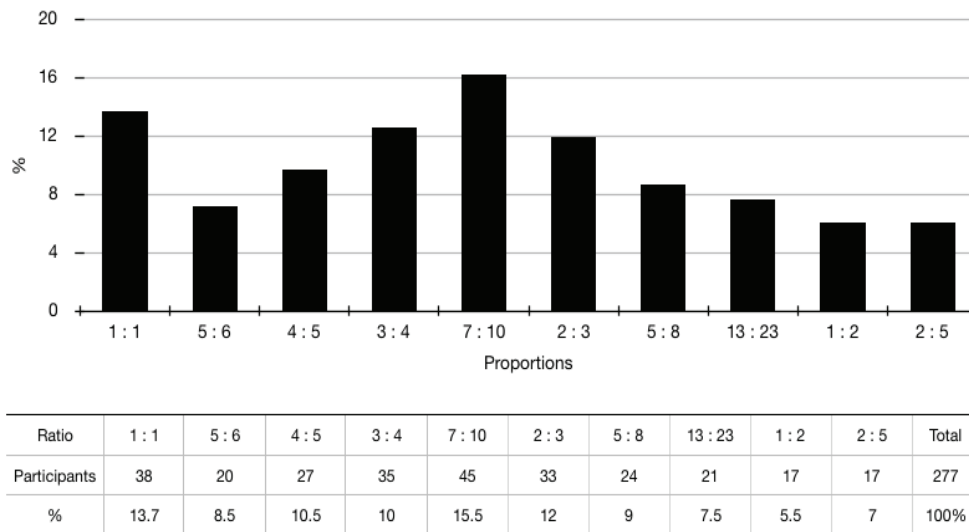


Fig. 3. Most preferred proportion in South Korea (Jung, 2017)

a distinctive and successful modern design culture in neighboring countries for example in Taiwan (Yao, Sun, & Lin, 2013). For this reason, this study tries to further the answer on the preference of proportions in Asia by focusing on Japanese products, specifically automobiles in this paper.

2. Method

The proportion analysis is the comparison of proportions between Japanese and German automobiles. The

automobiles were chosen by automotive experts in Japan and Germany (Japan, 1994; Wolfgang, 2011).

2.1. Selection of Automotive Analysis

For the Japanese automotive analysis, the collection ranges from the start of the 1930s until the beginning of 2010s chosen by the Society of Automotive Engineers of Japan that was founded in 1947 to promote scientific culture. It has also expanded the industrial economy and improved the quality of people's lives by furthering the development of automobile science and technology

(Japan, 1994). The selections of 55-passenger sedan automobiles were analyzed, and the companies that were selected are as follows: Toyota, Honda, Nissan, Mazda, Suzuki, Subaru, Daihatsu, Isuzu, and Mitsubishi. For the analysis of German automobiles, 50 iconic passenger automobiles were selected from a book ‘Deutsche Auto-Ikonen: 50 unvergessene Modelle’, and the selection was chosen by Wolfgang Blaube, a German expert and journalist in classical and historical automobile research (Wolfgang, 2011). The sedan was chosen for this research-based due to its common existence worldwide (Automobile Magazine, 2009).

2.2. Procedure for Analysis

The proportion analysis is important since it represents the visual thinking process that “pervades all human activity, from the abstract and theoretical to the down-to-earth and every day” (McKim, 1972). Hence, the importance of context and product analysis is an essential part of this study, since objects are not only analyzed for their existence, but for their iconic contextual origins. Rectangle construction method described by Elam’s book “Geometry of Design: studies in proportion and composition” and diagrams (Fig. 4) from the “The Geometry of Art and Life” (Ghyka, 1977) were used for proportion analysis.

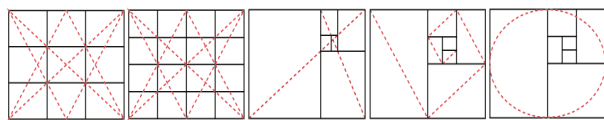


Fig. 4. Tools for the analysis of Rectangle constructions

To have a better understanding of the automotive proportion analysis, the method has to be explained in detail.

The proportion of automobiles was calculated by their actual size of each side view of the automobiles considering its height and length. Fig. 5 illustrates a proportion analysis of Porsche 911 Carrera RS, and the analysis method is based on the previous proportion studies (Elam, 2001).

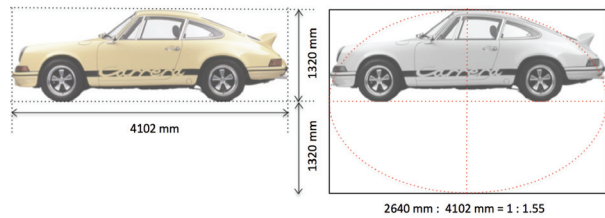


Fig. 5. Proportion analysis of Porsche 911 Carrera

3. Result

3.1. Japanese Automotive Analysis

3.1.1. 1860 - 1940

The Toyota AC was the first mass-produced Japanese manufactured passenger car. It fits into a diagram of proportion with 1:1.40 rectangle.

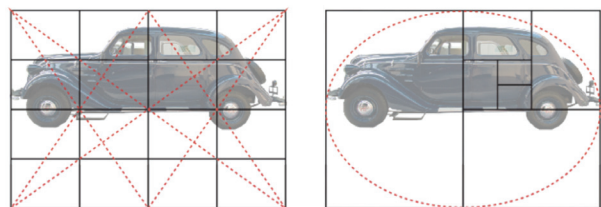


Fig. 6. Analysis of Toyota AC (1943)

Fig. 6 shows that the shoulders of the car fit into the upper horizontal lines that are proportioned, but are not inline with the windows that are higher.

3.1.2. 1950 - 1970

The Corolla (Fig. 7) literally cemented the automobile culture into Japanese society. The car was massively popular through its high performance at the time and advanced technology in safety and ride quality (Japan, 1994). Corolla shows that the horizontal lines divide the floor with the beginning of the windows and shoulders of the car. Moreover the rectangle fits perfectly into the proportion of 1:1.4.

The Honda 1300 (Fig. 8) fits into a rectangle of 1:1.43, the horizontal lines divide the floor, beginning of the windows, as the line continues throughout the car. The vertical lines divide the beginning of the deck and end of the side windows. The Honda 1300 was the largest

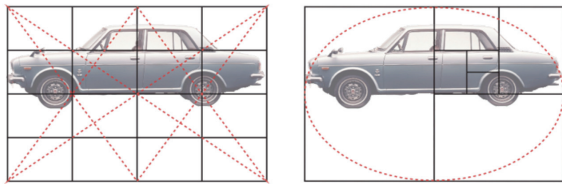


Fig. 7. Analysis of Toyota Corolla (1966)

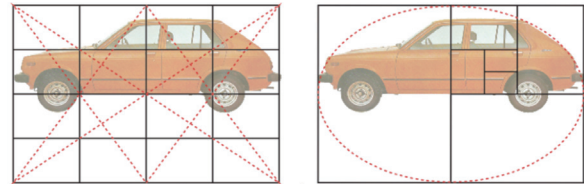


Fig. 9. Analysis of Toyota Starlet (1978)

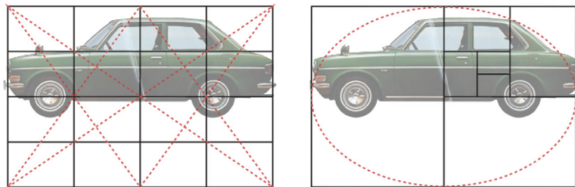


Fig. 8. Analysis of Honda 1300 (1969)

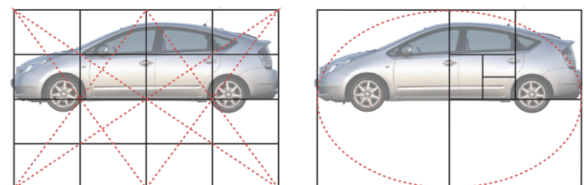


Fig. 10. Analysis of Toyota Prius (1997)

car produced by Honda at the time and one that endured the most design changes over its development period. The car was sold solely in the Asian market (Japan, 1994).

3.1.3. 1970 - Present

Toyota Starlet shows that the horizontal lines perfectly divide the floor and beginning of the windows, as well connect from the edge of the roof from the right and the beginning of the front tire (Fig. 9).

The rectangle fits perfectly in a 1:1.4 proportion. The ellipse perfectly aligns into the back and front of Toyota Starlet. The Prius (Fig. 10) was a technology advance into hybridization, becoming the first production vehicle that used an electronic and combustion engine. As the car was not only a technology direction for Toyota, it was also a design leader while concentrating on environ-

mentally friendly materials for its interiors (Japan, 1994). The Prius fits into a rectangle with a proportion of 1:1.4, as the vertical lines divide the body into three parts - front, middle and back. The Horizontal lines divide the car into two parallels, floor and the beginning of the windows, as the ellipse directs the front and back lights of the car.

3.1.4. Japanese Automobile Proportion

To sum up, 55 Japanese automobiles were evaluated by its proportions, seen in Fig. 11 and Fig. 12. Fig. 11 is divided by Year, through the y-axis and by proportion, the x-axis. Each dot is numbered and signifies an automobile. Fig. 11 shows overall we see that the significant of the automobiles proportions are around 7:10. Although vehicles with various ratios have been launched with times and on purposes, it can be explicitly

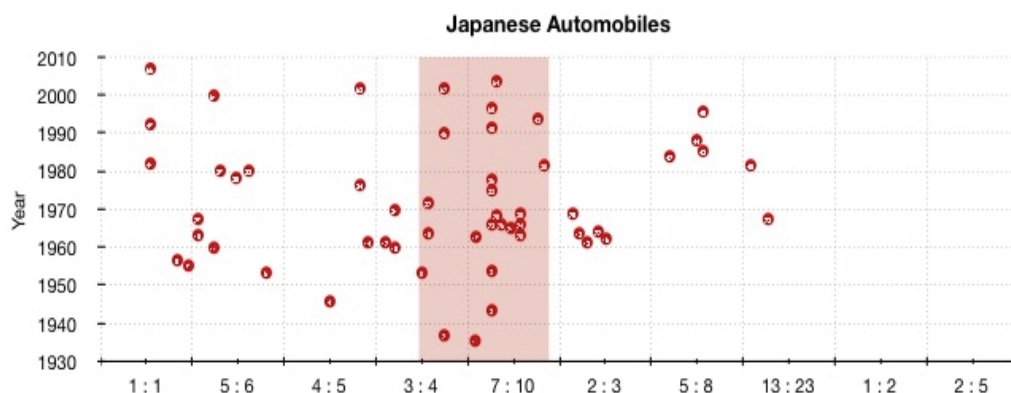


Fig. 11. Japanese automotive proportions by years from 1930 to 2010

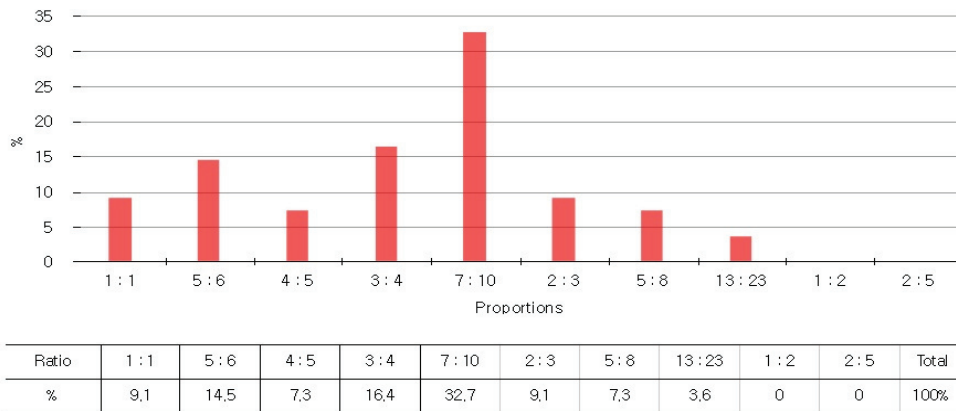


Fig. 12. Japanese automotive proportions by percentage

seen that the largest number of vehicles are included in the ratio of 7:10 over 80 years as shown in Fig. 11. Fig. 12 also clearly shows the results, the majorities, 32.7 percent Japanese automobiles were designed with the proportion of 7:10. Also, there is a tendency that the further away from ratio 7:10, the less the number of vehicles released at the corresponding ratio.

3.2. Comparison of German Automobile

One in every five cars worldwide carries a German brand, and 21 of the world’s top 100 automotive suppliers are German companies (Automobilwoche, 2015). From the history of the automobile, German automobiles lead in manufacturing many of the world top vehicles, so it is important to analyze the proportion of German automobiles and compare with Japanese automobiles proportion. Fig. 13 represents the results

that the majorities, 24 percent German automobiles were designed with the proportion of 13:23, and it shows that as the aspect ratio increases around 13:23, the number of automobiles decreases gradually. This tendency of continuous decreasing in the ratio clearly shows that there is a different trend in the ratio of the automobile in two countries.

In Fig. 14, the grey dots show the results from 55 Japanese Automotive proportion analysis, and the black dots represent the analysis result from the 50 German automobiles. Moreover, the German automobiles have the ratio of 13:23 area with 24 percent, but Japanese prefer the same ratio with only 3.6 percent. The Japanese automobiles have the proportion of 7:10 with 32.7 percent and the area is close to 3:4 rather than 2:3 and German automobiles prefer the same proportion (7:10) with only 12 percent. To conclude, the result of the proportion analysis comparing with German and

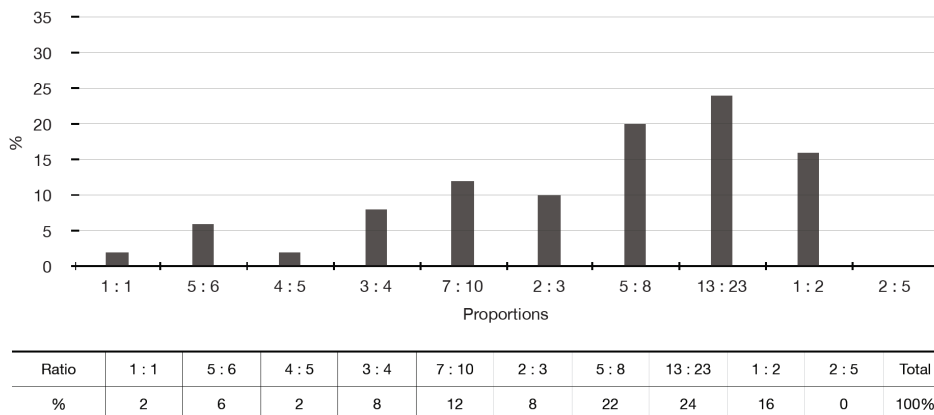


Fig. 13. German automobile proportions by percentage

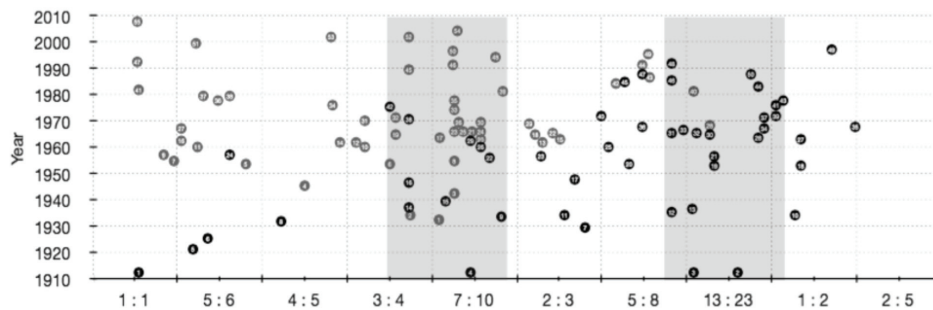


Fig. 14. Japanese and German automobile proportions from 1910 to 2010

Japanese automobiles, the graph demonstrates that Japanese automobiles are shorter in proportion compared to the German automobiles.

4. Conclusion and Discussion

This study tries to answer the research questions whether the preference of golden ratio is universal or there is a difference in the preference of proportions in different cultural backgrounds in Japan and Germany.

The result of this study shows:

1. Japanese automobiles have a shorter ratio than German automobiles, and the golden ratio is not the most preferred proportion in automotive design for both countries.

2. Japanese have a similar preference for proportions with Korean, and it is distinct from German preference.

This result shows that Japanese automobiles have the most preference of a proportion at 7:10, the same proportional preference of South Korean (7:10). It contradicts that German automobiles had a strong preference for a longer ratio with 13:23.

This implies that there is a different taste on the specific proportion between Asia and Western countries. The achievements of the Eastern and Western for the past years were remarkably different, and it also influenced on their social structures and the intellectual aspects of each society. Eastern see objects in contexts, whereas Western focus primarily on the properties of objects, and this shapes their characteristics, behaviors, and even the design of their daily objects.

However, this study is not a dichotomy between Asia and West. It insists the need for recognition of each culture characteristics, so it may arouse a harmony where cultural sensitivity aspects needed. In an interview, Wolfgang Egger, Audi Chief Designer, stated how difficult to create an automobile that would be attractive on a global scale. Egger continued to state that success of automobile design in a global market “has to be proportioned in a way that it feels emotional” (Pressman, 2012). This interview points out that proportion already plays a major role in the automobile design that makes the automotive globally distinct. The findings from this study make a salient contribution, since finding the most appropriate proportion in different types of products is a major issue of design aesthetics, so this result can be adapted to different fields of the design process for a new product development where strong cultural value exists.

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