iced19

FROM THE CAR STYLE PREGNANCY TOWARDS THE BRAND COUNTRY ORIGIN RECOGNITION

Bluntzer, Jean-Bernard (1); Ostrosi, Egon (2)

1: Université de Bourgogne Franche-Comté, UTBM, Pôle Transports et Mobilités, ERCOS/ELLIADD, France; 2: Université de Bourgogne Franche-Comté, UTBM, Pôle Industrie 4.0, ERCOS/ELLIADD, France

ABSTRACT

In the modern automotive industry, a car's style clearly defines its brand. In the context of globalization, a question has recently emerged concerning the relationship between a country's culture and the car style of a particular brand. The style is one way to place car morphologies into a meaningful structure, called the "telling structure." This research hypothesizes that a stylist tries to compress a car's form and make it a refined unicum that is streamlined with some inherent features, which express a brand's cultural aesthetics. Using the cognitive paradigm that an end user transforms explicit references into implic-it references and that the telling structure of a car's design features influences the recognition of the brand, this research demonstrates a novel method to ad-dress this hypothesis. Results from this study show that there is a relationship between the brand's country of origin and the perceived recognition of a car. However, a country's brand culture is not always represented by the style of the cars. In particular, the results indicate that some cars can actually lose their cultural identity, especially in the context of a worldwide market.

Keywords: Emotional design, User centred design, Human behaviour in design, Automotive styling, Design cognition

Contact:
Bluntzer, Jean-Bernard
Université de Technologie de Belfort-Montbéliard, France
ELLIADD- ERCOS
France
jean-bernard.bluntzer@utbm.fr

1 INTRODUCTION

In the context of globalization, the relationship between a car's style and a country's cultural identity has become an important topic of concern. Throughout the last decade, numerous automobile innovations have been proposed that only slightly modify the car's style. Therefore, we can ask about the importance of the style as part of the innovation and design process. In this context, where innovation remains predominant in this process, how can we currently define the notion of innovation? The notion of innovation remains complex. However, according to Fukuda (Fukuda, 2010), globalization is rapidly changing the world from being insular with clearly defined boundaries to a more open world without boundaries and with frequent and extensive exchanges of information across cultures. At the same time, designs are changing from being designer-centric to being more user-centric. In this new design world, wisdom will be an essential component of the engineering process and emotions will play an important role in creating effective designs. Recent research has shown how emotions drive human judgement and influence daily actions and decisions (Fukuda, 2017).

In a similar vein, products should possess a tonality that is developed through a strong brand identity (Burnap et al., 2016; Kapferer, 2011). This brand identity needs to evoke a strong emotional reaction in consumers in order for it to sustain a loyal customer base. For the automobile industry, brand identity is typically manifested through a combination of the car's physical qualities, experience with the product, and an overall appreciation of the brand by the consumer. Sometimes, brand identity can even emanate from the overall success of the brand itself (Cagan and Vogel, 2002). A car's brand identity is often formed throughout its duration on the market, the fundamental value of the brand, and the brand's cultural heritage. For example, Scandinavian heritage for the Volvo brand, British heritage for the Jaguar brand, American automotive design heritage for the Cadillac brand, and Italian heritage for the Alfa Romeo brand all represent car brands that are valued due to their country of origin (Karjalainen, 2007).

A style is a way to treat the car's morphologies and place them into a meaningful structure, called the "telling structure" (Ostrosi et al., 2018). Put more simply, a car is a form endowed with some structural stability and the style is a dynamic structure. The evolution of characteristic lines of a style should preserve the property of functional homeostasis (the same functional states) as well as the property of homeorhesis (the same stable course of change) (Ostrosi et al., 2018). For many car companies, stable brand recognition is an important design specification. A stylist designs both the salience and the pregnancy of the brand. Given a set of different cars, a certain brand will be salient if it can be distinguished on the basis of its geometrical and physical properties. Thus, the geometrical and physical salience of the cars, designed by the stylist, plays an important role in the success of the brand. The form's pregnancy is closely related to the intentions and the concerns of the human. A spatial form is 'pregnant' if its perception causes great physiological or behavioral response in the observer (human or animal!)" (Thom, 1980, 1982; Wildgen and Brandt, 2010) Therefore, it is then any form of the car that every human, from user to the stylist, can see from his or her point of view.

The research presented in this paper hypothesizes that stylists often attempt to compress the form and make it a refined unicum, that is streamlined with some inherent features of brand. These styling features can express the sociocultural aesthetics of a country's brand. Thus, this research focuses on the connection between a brand's features—expressed through a car's unique style—and user recognition of that particular brand. The second section of this paper provides an overview of research conducted on brand and car styling. In the third section, we offer an approach for analyzing the relationship between the consumer's cognitive process and the design contents. The conclusion demonstrates the value of the proposed analysis and provides a discussion of the findings.

2 STATE OF THE ART

Users first encounter a product through its external style (Vignesh et al., 2007). Therefore, the style of the product needs to be visually attractive (Fenko et al., 2010), which will be reinforced by the tonality of the brand. The Audi brand states that more than 60% of consumers base their decision to buy a car on the overall style of the product (Kreuzbauer and Malter, 2005). This finding can also apply to many other types of products (Warell and Young, 2011). For example, Steele et al. (Steele et al., 2008) highlights that aesthetic features of the tennis ball—that is, the product perception by the end user—are valued more highly than any of its technical aspects. In this context, the notion of visual brand identity (Snelders et al., 2011) is a key concept for a brand's product.

All products today need to be clearly identifiable by the end user in order for them retain a strong consumer base. Due to the fact that visual brand identity is so important, a lot of research has been performed on this topic. So far, there are two key findings. The first aspect concerns the decomposition approach, which means that the end user recognizes the product brand by recurring features that are carried over or slightly modified from the previous iteration (Calabrese, 2011). Ranscombe et al. (Ranscombe et al., 2012) developed an approach to identify the aesthetic features that make an automotive brand distinguishable through a specific decomposition of a car. Decomposition and shape grammar are also used for producing car styles (Bluntzer et al., 2015; McCormack et al., 2004; Orsborn et al., 2006).

The second aspect defines visual brand identity as the possibility for the shape of a product to provoke or engender certain ideas in the end user, including emotions. Research on visual brand identity strives to understand how the end user perceives a product. For example, Sacharin et al. (Karjalainen and Warell, 2005)] focus on the perception of the "green" aspects spread by a future product. Based on this definition, Karjalainen et al. claim that a product's design can be divided into two levels: explicit and implicit references (Karjalainen, 2007) (Sacharin et al., 2011). The explicit references, defined as aesthetic features, are based on the consumer's conscious level of attention, and the implicit references, defined as emotional reactions, are based on the consumer's unconscious level of attention. For example, dynamism, robustness, and safety would all be categorized as implicit references for a car.

Despite these advancements in understanding how visual brand identity affects consumer habits, the integration of different cognitive processes depending on the sociocultural identity of the end user has not been sufficiently investigated. Then, each end user employs their own cognitive process to build implicit references. The proposed research aims to explain socio-economic contents (cognitive process of the consumers) through the design contents of cars. This research focuses mainly on the cognitive process that transforms explicit references into implicit references. The proposed approach uses a qualitative research paradigm. Qualitative research has been characterized by concerns with the telling of the design contents of cars, which evoke an emotional and aesthetic perception in relation to a country.
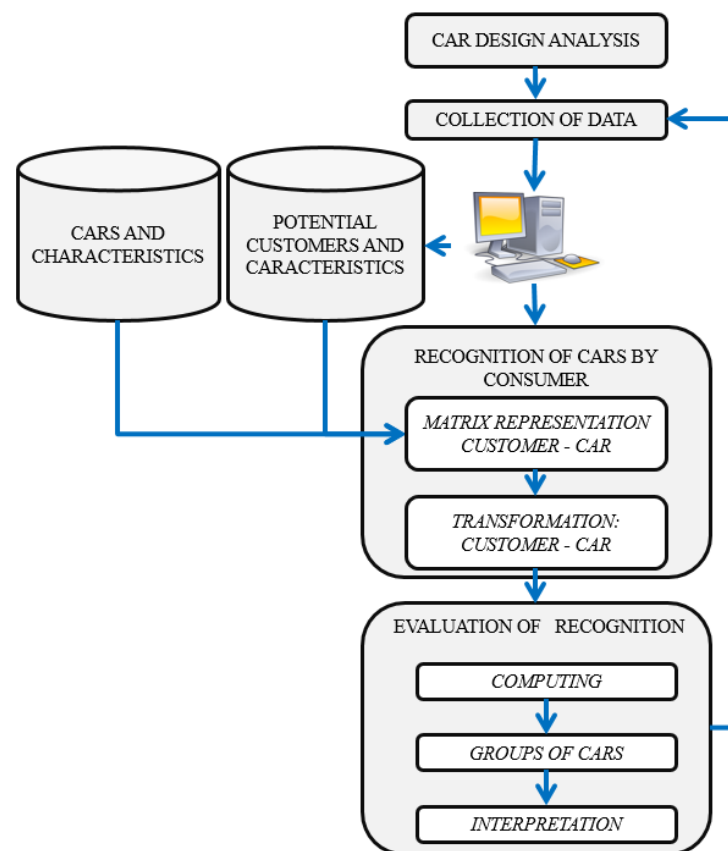
3   PROPOSED METHODOLOGY

Figure 1. Methodology for brand country origin recognition and evaluation

Using this qualitative paradigm, the analysis is performed based on two important hypotheses. The first hypothesis stipulates that there is a cognitive process that transforms explicit references into implicit references for every end-user. The second hypothesis stipulates that the telling features of a car's design contents, which evoke an emotional and aesthetic perception in relation to a country, arise through the recognition process of the car's brand.

The exploratory study presented in this paper will be divided into three levels (Figure 1). The first level is dedicated to data collection methods. The data concerns the characteristics of a selected potential consumer and the characteristics of selected cars. The second level represents the relationship between consumer cognitive processes and design contents of cars. Representation of car recognition is proposed in this level. The third level evaluates recognition using two concepts: completeness and discrimination of recognition.

3.1 Collection of data

In this study, we considered two types of data: 1) potential consumers and their characteristics, and 2) a collection of cars and their characteristics.

Potential consumers and characteristics. Table 1 shows the set of characteristics and corresponding data considering the societal aspects of consumers.

Table 1. Characteristics and corresponding values of data

Characteristics	Data			
Educational level	Bachelor (35%)	Master (65%)		
Domain of education	Mechanics (44%)	Physics (18%)	Mathematics (12%)	Others (26%)
Gender	Male (72%)	Female (28%)		
Work experience	None (28%)	< 1 year (53%)	Between 1 and 2 years (12%)	> 2 years (7%)
Country of birth	France (86%)	Others (14%)		
Preferred study course	Scientifics (77%)	Practics (21%)	Humanities (2%)	
Work method	Concrete Experience (42%)	Reflective Observation (19%)	Abstract Conceptualization (19%)	Active Experimentation (20%)

Cars and characteristics. For the identification of potential styles that represent specific brand identities, the cars are chosen from countries with car design tradition. The set of chosen countries are: *{France, Germany, Italy, United States, Japan}.*

For each country, we selected car models from the late 1990s that had achieved commercial success. In this study, we selected French car models, German car models, Italian car models, American car models and Japanese car models. Car models are listed in Table 2. For each model, the style is determined by the following characteristics: *{Country, Brand, Segment, Emotion}.*

3.2 Recognition of cars by consumer

In order to analyze the relationship between consumers and cars, a questionnaire was first created. A matrix was then created using data from the questionnaire. The questionnaire was divided into two sections. The first section focused on the social aspects of the consumer and the second part concerned the styles reflecting brand identities. For the first part, we propose to gather information about the consumer's sociocultural aspects using multiple-choice answers. Responses to the questions are thereby defined using a binary approach. For the second part, we propose to use a fuzzy approach. For each question, the consumer can answer with a fuzzy set between [0;10]. For each car, a picture and a blueprint is given. All logos are removed from the materials so that the consumer can only evaluate the car from its overall style.
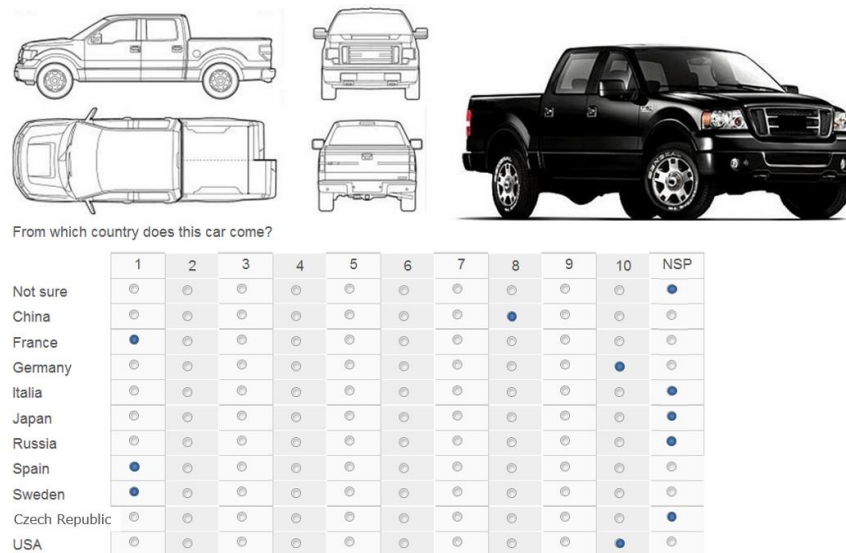
Figure 2. Example of answered material coming from the questionnaire

For instance, Figure 2 shows the questions for the presented car. The questionnaire was given to 50 university students from different countries and regions. The results of the data collection were compiled in a 58 x 1955 consumer-car matrix. Then, the consumer-car matrix was converted into a recognition matrix.

3.3 Evaluation of recognition

The evaluation of recognition is based on two concepts: completeness and discrimination. Completeness measures the consumer's degree of recognition for the car's country of origin. Thus, completeness C(k) is represented by the average value of the recognition of a car's country of origin.

For instance, the BMW 3 Series is clearly identified with a 6.4 x 100 = 64% completeness with regard to Germany

Discrimination measures the degree of inability to recognize all other countries k', k' $\neq$ k, where k is the country of origin for the selected car. Discrimination D(k) is computed from the following expression (1):

$$D(k) = C(k) - \frac{1}{n-1}\sum_{k' \neq k} r(k') \qquad (1)$$

where: $r(k')$ is the recognition of all the other countries k', $k' \neq k$

Table 2 shows the country recognition of a car based the specified consumer characteristics. By analyzing the recognition matrix and using two concepts: completeness and discrimination, it is found that male subjects more easily recognized cars styles than did female subjects in this sample population.

Figure 3 and Figure 4 illustrate an example of the results of the group car's recognition. Figure 3 shows the signature of the "Good" group car's recognition and Figure 4 shows the signature of the "Very Poor" group car's recognition. Our results indicate that the main difference between these categories is the bottom gap. In the "good" group, the gap is very small and in the "Very Poor" group, the gap is very large.

Figure 5 represents the distribution of cars using two concepts: completeness and discrimination. The distribution of cars clearly distinguishes seven groups of cars (Table 2). The "Good" group—including the Peugeot 206 (France), the Renault Clio (France), the Citroën C3 (France), the Renault Scénic (France), the M-Benz C-Class (Germany), and the Ford F-Series (USA)—is characterized by higher values of completeness and discrimination measurements. This group represents an overall good recognition by survey subjects. By contrast, the sixth group—including the Chevrolet Impala (USA), the Buick LaCrosse (USA), the Opel Corsa (Germany), and the Mazda Familia (Japan)—is characterized by lower values of completeness and discrimination measurements. This group represents an overall very poor recognition by survey subjects.

Between these two groups, there are four other groups characterized by (a) poor/very poor recognition: the Chevrolet Impala (USA) and the Buick La-Crosse (USA), (b) poor recognition: the Mitsubishi Lancer (Japan), the Fiat Stilo (Italy), the Toyota Corolla (Japan), the Honda Civic (Japan), the Lancia Ypsilon (Italy), the Pontiac G6, (USA), and the Suzuki Wagon R, (Japan), (c) fair recognition: the Alfa Romeo 147 (Italy), the VW Passat (Germany), the Alfa Romeo GT (Italy), the Cadillac De Ville (USA), the VW Golf (Germany), the Fiat 500 (Italy) , the Fiat Punto (Italy), and the Chrysler Voyager (USA), and (d) good/fair recognition: the Peugeot 607 (France), the Audi A4 (Germany), the BMW 3 Series (Germany) and the Ciroën C5 (France). Finally, the Nissan Tiida (Japan) is characterized by negative values of discrimination measurements. Put more simply, the consumer is confused with regard to the car's country of origin. This conclusion can be verified in Table 2. Here, the consumer perceives the Nissan Tiida (Japan) as representative of France.

What are some qualitative results from the analysis of these distributions based on the concepts of completeness and discrimination?
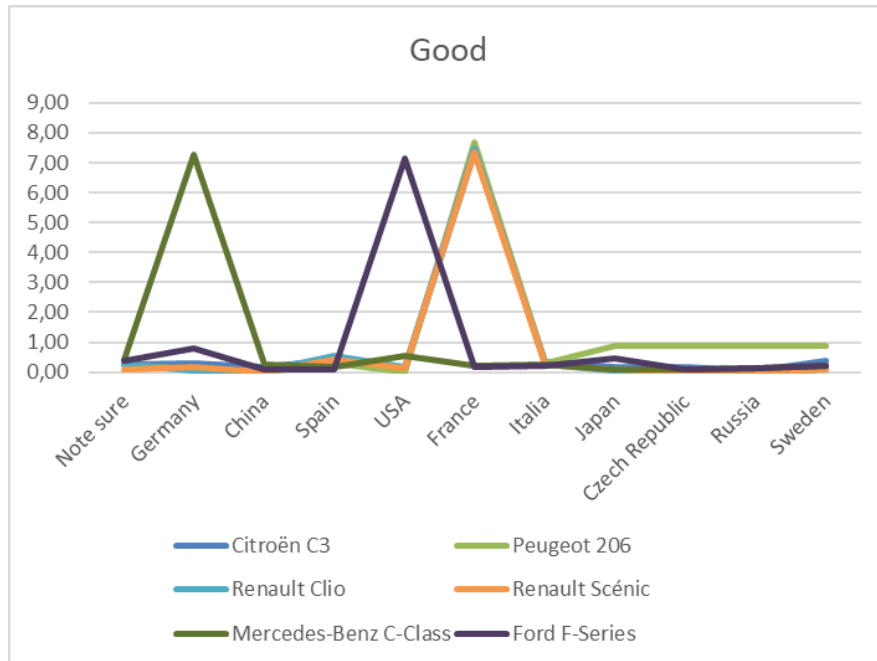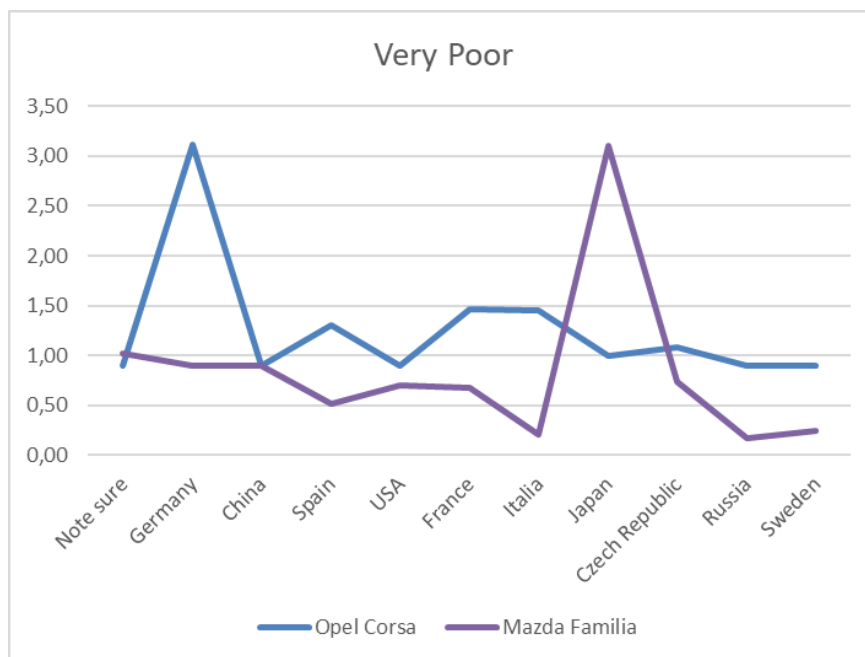

Figure 3. Car's recognition : "Good"

Figure 4. Car's recognition : "Very poor"

Table 2. Completeness and discrimination for selected cars

| Name	C(k) female	C(k) male	C(k)	D(k)	Rank
Peugeot 206, France	0,78	0,78	0,78	0,72	Good
Renault Clio, France	0,70	0,78	0,75	0,73	Good
Citroën C3, France	0,69	0,77	0,73	0,71	Good
Renault Scénic, France	0,68	0,78	0,73	0,72	Good
M-Benz C-Class, Germany	0,68	0,76	0,73	0,70	Good
Ford F-Series, USA	0,63	0,76	0,71	0,69	Good
Peugeot 607, France	0,53	0,76	0,68	0,64	Good/Fair
Audi A4, Germany	0,59	0,73	0,68	0,65	Good/Fair
BMW 3 Series, Germany	0,65	0,69	0,66	0,64	Good/Fair
Ciroën C5, France	0,53	0,71	0,65	0,61	Good/Fair
Alfa Romeo 147, Italia	0,54	0,65	0,61	0,57	Fair
VW Passat, Germany	0,44	0,67	0,60	0,57	Fair
Alfa Romeo GT, Italia	0,40	0,67	0,58	0,55	Fair
Cadillac De Ville, USA	0,41	0,67	0,58	0,55	Fair
VW Golf, Germany	0,43	0,64	0,57	0,54	Fair
Fiat 500, Italia	0,33	0,68	0,57	0,53	Fair
Fiat Punto, Italia	0,34	0,66	0,56	0,49	Fair
Chrysler Voyager, USA	0,33	0,66	0,56	0,53	Fair
Mitsubishi Lancer , Japan	0,24	0,56	0,46	0,40	Poor
Fiat Stilo, Italia	0,29	0,52	0,45	0,39	Poor
Toyota Corolla, Japan	0,40	0,45	0,43	0,36	Poor
Honda Civic, Japan	0,26	0,50	0,42	0,35	Poor
Lancia Ypsilon, Italia	0,33	0,42	0,39	0,33	Poor
Pontiac G6, USA	0,14	0,48	0,37	0,28	Poor
Suzuki Wagon R, Japan	0,18	0,44	0,36	0,28	Poor
Chevrolet Impala, USA	0,25	0,39	0,35	0,29	Poor/Very poor
Buick LaCrosse, USA	0,16	0,41	0,33	0,26	Poor/Very poor
Opel Corsa, Germany	0,19	0,37	0,31	0,20	Very poor
Mazda Familia, Japan	0,19	0,37	0,31	0,25	Very poor
Nissan Tiida, Japan	0,01	0,09	0,07	-0,02	Worst a
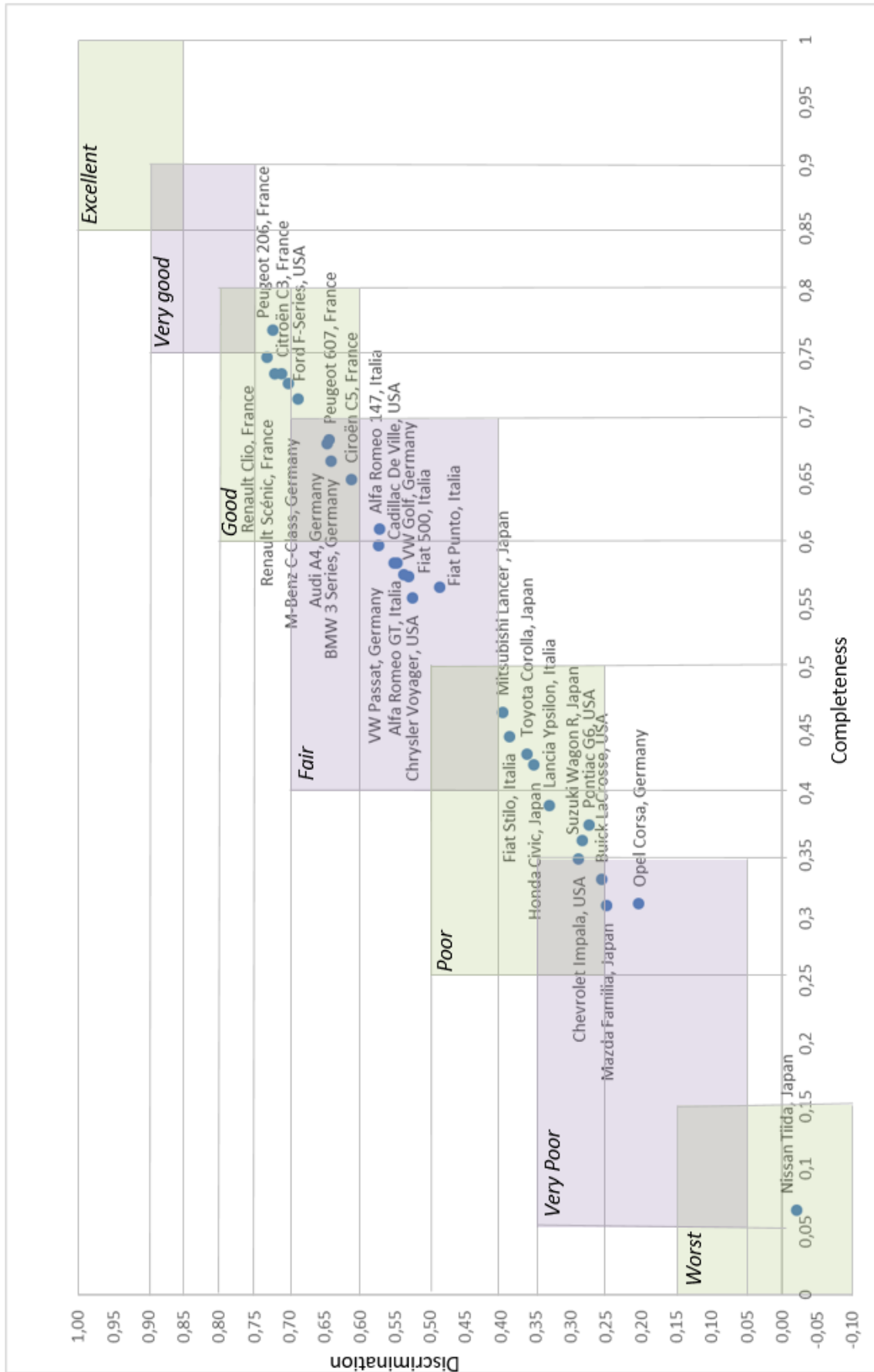
Figure 5. Distribution of cars using completeness and discrimination

Based on this observation, we can conclude that cars from the United States possess some explicit references that subsequently generate some implicit references through the cognitive process. For example, the Ford F-Series, which is not very visible on the European market, seems to be clearly recognized in the study.

In fact, the sport-utility vehicle (SUV) segment represented the canonical American style for our subjects. This might be because SUVs are typically larger than an average car, and for many Europeans, they associate this difference in size with American cultural aesthetics. For the Chrysler Voyager, another American car, we can propose the same analysis. In addition, the Cadillac DeVille is also well recognized by Europeans. In fact, the structure of the car, which is very long and with a protracted hood, is very typical of an American large/estate car. Our findings indicate that these cultural references are perceived by our European population sample.

By contrast, the Buick LaCrosse, the Chevrolet Impala, and the Pontiac G6—three popular American car styles—were not clearly identified by our subjects. The aforementioned references of size, which helped Europeans to recognize larger American cars, are not as salient in these cars. Instead, these cars fall within the medium/family segment, a more common category in Europe. As a result, people who have never seen these American models before have no references to attribute to a particular country. For this reason, these types of cars lose their American identity when categorized by Europeans.

Finally, two specific cars, the Opel Corsa and the Nissan Tiida, were very poorly recognized by our subjects. When we investigated the industrial strategy used for these cars, we discovered that the Nissan Tiida and the Opel Corsa were developed for worldwide commercialization under other brands. Our analysis also showed that these cars intentionally lack a country identity because they were designed for sale across multiple countries. Based on this reason, Europeans cannot recognize the country because these cars are built with generic, rather than specific, references.

4   DISCUSSION AND CONCLUSION

This paper addressed the relationship between car style perception and recognition of brand country origin. The main hypothesis was that a stylist tries to compress the form and make it a refined unicum streamlined with some inherent features, which express aesthetics specific to a country's brand. The result of this study confirms our hypothesis: that a cognitive process transforms explicit references into implicit references for every end-user. The study also confirms that the "narrative turn" of a car's design contents evoke a specific perception in relation to a country's culture. In addition, the results show that a brand's stylist and aesthetic designer do not always ensure that a car's style reproduces the brand's country of origin. We also found that a car can lose culturally identifying features when it is targeted for a global market.

The results show that a relationship is available between gender and accurate car recognition. Males were able to recognize a car's country of origin more easily than were females. This observation demonstrates that other social aspects of consumers are linked with specific design.

This study demonstrates how researchers can more thoroughly investigate the influence of cultural factors on consumer habits for cars, highlighting the importance of early aesthetic exploration for a car's style, particularly with regard to the culture of a country. This consideration can be extended to the principle: specific design for specific people.

From this research, we can conclude that country heritage appears to be a key concept in linking the explicit references or style of a car to its implicit references or emotional features. The proposed approach recommends the possibility of extracting and isolating the characteristic lines of a car's style that evoke a country with a specific culture. In regard to industrial design practice, this in turn highlights the importance of early aesthetic exploration for the car's style with regard to the culture of a country (Bluntzer et al., 2015). In addition, the car's style as a whole should be generated and developed from these important characteristic lines and can thus emphasize and complete this determination. New conjectures for car style designs on the current industrial design practice can be established through the integration the sociocultural dimension.

REFERENCES

Bluntzer, J.-B., Ostrosi, E. and Sagot, J.-C. (2015), "Styling of cars: is there a relationship between the style of cars and the culture identity of a specific country?", *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering*, Vol. 229 No. 1, pp. 38–51.

Burnap, A., Hartley, J., Pan, Y., Gonzalez, R. and Papalambros, P.Y. (2016), "Balancing design freedom and brand recognition in the evolution of automotive brand styling", *Design Science*, Vol. 2, Available at: https://doi.org/10.1017/dsj.2016.9.

Cagan, J. and Vogel, C.M. (2002), *Creating Breakthrough Products: Innovation from Product Planning to Program Approval*, Ft Press, Prentice Hall, Upper Saddle River, NJ.

Calabrese, G. (2011), "Structure and transformation of the Italian car styling supply chain", *International Journal of Vehicle Design*, Vol. 57 No. 2–3, pp. 212–229.

Fenko, A., Schifferstein, H.N. and Hekkert, P. (2010), "Shifts in sensory dominance between various stages of user–product interactions", *Applied Ergonomics*, Vol. 41 No. 1, pp. 34–40.

Fukuda, S. (2010), *Emotional Engineering: Service Development*, Springer Science & Business Media, London.

Fukuda, S. (2017), "Experience Engineering: Age of Process Values", *Emotional Engineering*, Vol. 5, Springer, pp. 1–17.

Kapferer, J.-N. (2011), *Remarques: Les Marques à l'épreuve de La Pratique-500 Marques Passées Au Crible*, Editions Eyrolles, Paris.

Karjalainen, T.-M. (2007), "It looks like a Toyota: Educational approaches to designing for visual brand recognition", *International Journal of Design*, Vol. 1 No. 1, pp. 67–81.

Karjalainen, T.-M. and Warell, A. (2005), "Do you recognise this tea flask? Transformation of brand-specific product identity through visual design cues", *Proceedings of the International Design Congress, IASDR 2005*, Douliou, Taiwan.

Kreuzbauer, R. and Malter, A.J. (2005), "Embodied cognition and new product design: Changing product form to influence brand categorization", *Journal of Product Innovation Management*, Vol. 22 No. 2, pp. 165–176.

McCormack, J.P., Cagan, J. and Vogel, C.M. (2004), "Speaking the Buick language: capturing, understanding, and exploring brand identity with shape grammars", *Design Studies*, Vol. 25 No. 1, pp. 1–29.

Orsborn, S., Cagan, J., Pawlicki, R. and Smith, R.C. (2006), "Creating cross-over vehicles: Defining and combining vehicle classes using shape grammars", *Ai Edam*, Vol. 20 No. 3, pp. 217–246.

Ostrosi, E., Bluntzer, J.-B., Zhang, Z. and Stjepandić, J. (2018), "Car style-holon recognition in computer-aided design", *Journal of Computational Design and Engineering*, Available at:https://doi.org/10.1016/j.jcde.2018.10.005.

Ranscombe, C., Hicks, B., Mullineux, G. and Singh, B. (2012), "Visually decomposing vehicle images: Exploring the influence of different aesthetic features on consumer perception of brand", *Design Studies*, Vol. 33 No. 4, pp. 319–341.

Sacharin, V., Gonzalez, R. and Andersen, J.-H. (2011), "Object and user levels of analyses in design: the impact of emotion on implicit and explicit preference for 'green'products", *Journal of Engineering Design*, Vol. 22 No. 4, pp. 217–234.

Snelders, D., Morel, K.P. and Havermans, P. (2011), "The cultural adaptation of web design to local industry styles: a comparative study", *Design Studies*, Vol. 32 No. 5, pp. 457–481.

Steele, C., Jones, R. and Leaney, P. (2008), "Improved tennis ball design: incorporating mechanical and psychological influences", *Journal of Engineering Design*, Vol. 19 No. 3, pp. 269–284.

Thom, R. (1980), *Prédication et Grammaire Universelle*, New York, NY.

Thom, R. (1982), *Modèles mathématiques de la morphogenèse*.

Vignesh, R., Suganthan, R. and Prakasan, K. (2007), "Development of CAD models from sketches: a case study for automotive applications", *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering*, Vol. 221 No. 1, pp. 41–47.

Warell, A. and Young, K. (2011), "Interior aesthetics: an experience-focused approach for the design of brand-specific automotive identity", *International Journal of Vehicle Design*, Vol. 55 No. 2–4, pp. 278–303.

Wildgen, W. and Brandt, P.A. (2010), *Semiosis and Catastrophes: Rene Thom's Semiotic Heritage*, Vol. 10, Peter Lang.