Assessment of Adequacy of Product Appearance Attributes to the Design Objective

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ABSTRACT

A new method for assessment of product aesthetics ("Assessment of adequacy of product appearance attributes to the design objective and to values of market segment", Adequacy Method, in short) was developed by the author. The method is based on the need to assess product aesthetics against the design objective and the human values / goals of the target market segment. In a pre-test, eight products (from four classes) with the most different design were chosen for testing the method. Then, in an experimental study, the products were assessed using the proposed method by students from a technical university. After statistically analysing the assessment results, it was found that the method criteria and the method itself proved to be reliable, efficient, and clear. The proposed method was also tested by comparison with a complex method (FTESE – Functional, Technical, Ergonomic, Significance and Esthetic Analysis). The same products used in the paper presenting the FTESE method were assessed using the proposed method and lead to the same ordering of products according to their aesthetics. But the comparison also indicated that the proposed method allows for a superior refinement.

KEYWORDS: *design assessment, evaluation method, product appearance, product aesthetics.*

JEL CLASSIFICATION: *L60, M31*

1. INTRODUCTION

It can be considered that industrial design appeared together with the Industrial Revolution and mass production. In the beginnings, the concentration of creative effort in the industrial field was on the functionality of the product, considered to be the one that matters for the individual and society, in accordance with the utilitarian theory of John Stuart Mill. Later, one of the promoters of the Deutsche Werkbund, namely Gottfried Semper, introduced a theoretical principle, according to which product shape is dependent on function, material, and technology (Bürdek, 2002), and the product aesthetics would result from considerations other than those of the science of beauty. Unfortunately, such a mentality is still maintained in certain departments of productive companies.

The general public and design novices believe that product development is a linear process from idea to finished object. Professionals know that this is not the case and that, in order to obtain a competitive product adapted to the requirements of the market segment, some stages are iterative, and the end of an iteration is an assessment of the stage results. And in the case of the product aesthetics, the concepts generated are assessed from the point of view of industrial design in order to choose the best one and proceed to the detail design. Also, the product aesthetics are assessed in different phases of development to determine if the design process is going in the desired direction or if major changes to the product aesthetics are

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needed. The assessment should identify the positive characteristics, which deserve to be maintained, and the negative characteristics, which should be eliminated or minimised.

In the product development process, the following problems associated with the assessment of product aesthetics may arise.

- Designers, in general, and especially the product manager who has a decisive role in the product evolution, ignore the importance of the product aesthetics for the commercial success of the product.
- The industrial design assessment is not carried out by the right person(s). Not the design critic, not the designer, not the product manager should assess the industrial design, but the representatives of the targeted market segment, of course, with the support and guidance of the company's specialists in marketing and product aesthetics.
- The objective of the design process and the values of the targeted market segment are often ignored, not only in the assessment process, but also in the design process.
- The criteria for assessment of product aesthetics are not well chosen. Often, the criteria proposed by various authors or industrial designers are not clear and effective. These criteria may look spectacular in a scientific article, but are of little actual use.
- For most, the attributes associated with the criteria are not definitively positive or negative. If the design of a product is disharmonious, this does not mean that the design will not be attractive to the targeted market segment.

Therefore, it is necessary for the product designer to use an aesthetic assessment method characterised by a high degree of objectivity, easy to apply, and clear criteria.

2. LITERATURE REVIEW

The product aesthetics is an important feature in the decision-making process of purchasing a new product. Scientific experiments have indicated that product aesthetics have a considerable influence on consumer preferences (Stanton et al., 2016). Consumers attribute a higher value (price) to products with a high aesthetic level, and buying intent is considerably higher for the high-design-aesthetic products (Shi et al., 2021). In-depth studies have revealed that when consumers are unsure of the product's functional performance, the elaborated aesthetics and brand reputation offset the uncertainty and contribute to the strengthening of purchase decision (Landwehr, 2024). The research focused on the importance of product aesthetics not only at the generic level but also in specific cases. For example, the aesthetics of car casing were found to be the highest sales forecasting indicator, followed by price and brand (Landwehr et al., 2011).

The idea that the evaluation should be performed according to the target market segment also results from various considerations in the scientific literature. Thus, it was found that aesthetic attractiveness varies according to background, culture, age, and gender (Khalid & Hellander, 2006) and that the aesthetic experience is individual (Liu et al., 2020).

From the above, it results the following rules related to the assessment of product aesthetics:

- An objective and clear assessment method should be used.
- The evaluation should be carried out with the help of representatives of the targeted market segment, according to the principles of participatory design (codesign).
- The assessment criteria should be simple, clear, and relevant, because they will be used by non-specialists, respectively, representatives of the market segment.

- When summarising the assessment results, the purpose of the product and the values of the market segment should be taken into account, i.e. not always a high score (on a Likert scale) obtained for a criterion is beneficial.

Usually, the research focuses not on the criterion itself, but on the discovery of the criterion's attribute/value recommended for product aesthetics in general. Let us consider a hypothetical example: a group of researchers discovers that the industrial design of a (generic) product should be simple, symmetrical, with a high degree of typicality. Such an approach is obviously not useful, as a recommendation cannot be made for all product classes. Besides, the researchers are involving several hundred subjects in the experiment, in the best case, which probably do not represent any precise market segment anyway. Therefore, the industrial designer should have at her/his disposal a simple assessment tool for effective use.
Another research approach in the field of product aesthetics is the assessment of aesthetic interest in product design, in addition to the assessment of aesthetic pleasure, which is the traditional assessment approach. It was discovered that aesthetic pleasure and aesthetic interest are inversely proportional characteristics and are influenced by the fluency of visual information processing (Reber et al., 2004), respectively, the simpler the aesthetics of a product, the greater the pleasure, respectively, the interest being smaller (Graf, & Landwehr, 2015; Graf, & Landwehr, 2017). However, Shi et al. (2021) found that when seeing beautiful products with an award-winning design, subjects showed great interest and a high level of emotions. Anyway, it is a reductionist approach to consider that the beauty of a product depends on the fluency processing of visual information.

It can be considered that the first effective method for assessment of product aesthetics (and not only) was Osgood's Semantic Differential (Osgood et al., 1957). This method can be used by any evaluator, based on the criteria chosen by her/him. Since the criteria are important for the accuracy and relevance of the results, it is not recommended to use this method in a free-of-choice system. The essence of this method is the basis of most other methods (Table 1).

Table 1. Assessment Methods Based on Semantic Differential

Method proposed by ... (publication year)	**Aesthetic Criteria**
Ellis (1993)	simplicity/complexity; harmony; balance; dynamics; unity; timeliness-style; novelty
Blijlevens et al. (2009)	modernity, simplicity; playfulness
Lacruz Rengel (2013)	utility; competitiveness; originality; pertinence; representativeness; expressiveness
Blijlevens et al. (2014)	aesthetic pleasure; typicality; novelty; unity; variety
Khalighy et al. (2014)	beauty (contrast; proportion; pureness) attractiveness (novelty; perception of function (appropriateness))
Homburg et al. (2015)	aesthetics, functionality, and symbolism
Mayer & Landwehr (2018)	visual simplicity; visual symmetry; visual contrast; visual self-similarity.

Source: author

The aesthetic criteria presented in Table 1 require a brief evaluation, especially from the perspective of the evaluator, who should be a representative of the market segment, so not necessarily a specialist or a refined connoisseur of aesthetics. Could any person objectively assess aesthetic pleasure? What would be the metric for competitiveness, expressiveness, or relevance? What does pureness mean? From the description of the authors it would seem that

it is simplicity, but perhaps it expresses more, but what? "Self-similarity means that zooming in and out of an image reveals the same repeating visual pattern." (Mayer & Landwehr, 2018). Should someone understand that the texture of a blender should be in the shape of a miniature blender? Among the unusual criteria, one seems appropriate: perception of function (appropriateness), respectively, the extent to which the product design indicates the way of use.

There are also much more complex methods of assessment. Warrel (2001) proposes the Format Method, which is essentially based on the criteria of harmony, dynamism, complexity, balance, and unity. Crăciun (2002) elaborates the FTESE method (**F**unctional, **T**echnical, **E**rgonomic, **S**ignificance and **E**sthetic Analysis), a very complex method that approaches product aesthetics from the five dimensions which gave the method name. There are also methods that are not based on the use of criteria for assessment of product aesthetics. Some of these methods focus on consumer behaviour (Pamfilie & Procopie, 2001), while others are more practical, apparently objective, such as monitoring the eye movement of the participants in the experiment (Liu et al., 2020).

From the above, it is obvious that there is a need for a new assessment method that takes into account the evaluation conditions, clarity of application, and understanding by the representatives of any market segment. Thus, the idea of the "Assessment of adequacy of product appearance attributes to the design objective and to the values of the market segment" method appeared. The method was drafted for the first time in the paper (Dumitrescu, 2003). The proposed criteria were analysed through an experiment in (Dumitrescu & Crăciun, 2019). Exploratory Factor Analysis and Confirmatory Factor Analysis were applied, and the new criteria resulted: functionality (options: functional / non-functional), ergonomics, harmony, balance, proportion, compactness, elegance, complexity, neatness, novelty, originality, distinctiveness, origin of form, and temporal orientation. For most criteria, the evaluation is carried out using a Likert scale. The score obtained (high or low) indicates the proximity to one of the two antagonistic attributes, and the resulting attribute is considered positive or negative according to the contribution to the design objective and the materialisation of a value of the targeted market segment. It is mentioned that Kahle's List of Values or a similar system or Young and Rubicam goals can be used to determine segment values.

The criteria system of proposed assessment method was established by applying complex and reliable methods such as Exploratory Factor Analysis and Confirmatory Factor Analysis. The question now is whether the criteria are clear to the general public.

3. RESEARCH DESIGN AND METHODOLOGY

Taking into account what was presented in the introduction (actually a brief review of the scientific literature), the research objectives were established:

- **RO1:** Appraisal of efficiency and clarity of assessment criteria;
- **RO2:** Method testing by comparison with a complex method.

It was decided that the efficiency and clarity of the assessment criteria will be evaluated by the measure of the correct decision (Ou et al., 2012; Wei et al., 2012). The value of the measure of correct decision (CD) is calculated by the proportion of the number of correct answers against the number of all answers.
Because of the author’s knowledge of complexity of FTESE method (Crăciun, 2022), this one was selected as the term of comparison in achieving research objective number 2.

To approach research objective 1 (RO1), the following line of action was followed. It was decided to select four classes of products, and from each class to choose four products with as different design as possible. When choosing products, care would be taken that their aesthetics presented (as much as possible) one extreme attribute for as many criteria as possible. It was also decided to run a pre-test in which each of the 16 products would be assessed according to the criteria from the work of Dumitrescu and Crăciun (2019), to which a control question related to the product beauty was added. (The experiment questionnaire is presented in the Appendix.) The results of the pre-test would be used to choose pairs of products with a contrasting aesthetic. The four selected product classes were: vacuum cleaners, wall clocks, motorcycles, and watering cans. Figure 1 shows some of the selected products.

After running the pre-test and choosing the significant pairs of products for each class, a new experiment will be organised using the same questionnaire, but with other participants than those involved in the pre-test. The results of the experiment will be analysed statistically.

Figure 1. Four products used in experiments
Source: author's work

Considering the second research objective (RO2), it was decided to apply the same questionnaire for the products used in the case studies from Crăciun's thesis (2022), in order to check if the method described in this work allows the same ordering of products as the FTESE method. The products used as case studies in Crăciun's thesis were three chairs, three coffee tables, and three bedside tables.

4. EXPERIMENTAL RESULTS

4.1 Pre-test

The pre-test was performed with 56 participants (31 women and 25 men). The mean age was 27.1 years. All participants were students enrolled at a large technical university in Romania. The participants had basic training in product aesthetics. The participants were screened for visual deficiencies. The participants were not financially rewarded for their participation in this research. The product images were presented on computer screens, where appeared with a height of 8 cm. All computer monitors were of the same model and were properly calibrated. The assessment method and all the criteria were explained in-depth to the participants. It was specified to the participants that there may be no connection between the marks given. It is possible for a product to obtain a 7 on one criterion and only 1 on the next criterion.

The accuracy of results was tested using *Z-score*. No *Z-scores* were outside the interval [-3; +3], so no data sets were eliminated. The *Z-score* ranged between -1.84 and 2.80. The reliability of the data was tested using the Cronbach's alpha coefficient. The calculated value for the complete set of data was $\alpha = 0.964$, value which stands for a very good reliability.

The scores (average marks) obtained for the product aesthetics were in the range [1.83, 6.71] with many scores near the extremes, which allowed product pairs to be easily selected. Actually, in Figure 1, one element of each selected pair is displayed.

4.2 Study 1

The first study was conducted with 130 participants (63 women and 67 men). The mean age was 23.45 years (*SD* = 2.71). All participants were students enrolled at a large technical university in Romania. No participant from the pre-test was involved in this study. Participants received basic training in product aesthetics. The participants were screened for visual deficiencies. The participants were not financially rewarded for their participation in this research. The product images were presented on computer screens, where appeared with a height of 8 cm. All computer monitors were of the same model and were properly calibrated. The assessment method and the criteria were explained to the participants.

The accuracy of results was tested using *Z-score*. No *Z-scores* were outside the interval [-3; +3], so no data sets were eliminated. The *Z-score* values ranged between -2.82 and 2.88. The reliability of the data was tested using the Cronbach's alpha coefficient. The calculated value for the complete set of data was $\alpha = 0.886$, value which stands for a good reliability.

The scores (mark means) and measures of correct decision (CD) obtained by the products in Study 1 are presented in Table 2. The correct decision (CD) indicates the ratio of participants who gave the same mark to a product at a certain criterion. For example, the vacuum cleaner 1 scored 4.02 for beauty and 32% (0.32) participants gave mark 4. If a score falls roughly the middle of the range between two integers, both integers will be counted as a correct decision. In Table 2, such cases are highlighted in italics.

In case of product beauty, the measure of correct decision is between 0.22 and 0.38, which are rather small values, indicating that beauty is a not so clear criterion and subsequently not reliable. On the contrary, the rest of the criteria used in the experiment have a measure of correct decision between 0.67 and 0.91 (with 85% of values greater than 0.7). This clearly implies that all the criteria from work (Dumitrescu & Crăciun, 2019) are efficient, reliable, and clear to use.

Table 2. Scores and Measures of Correct Decision (CD) in Study 1

		Beauty	**Ergonomics**	**Harmony**	**Balance**	**Proportion**	**Compactness**	**Elegance**	**Complexity**	**Neatness**	**Novelty ratio**	**Originality**	**Distinctiveness**
Vacuum cleaner 1	Score	4.02	3.20	3.98	3.96	4.11	4.15	3.55	4.48	4.06	5.14	5.61	5.04
	CD	0.32	0.72	0.71	0.75	0.73	0.68	*0.78*	*0.79*	0.71	0.74	*0.82*	0.72
Vacuum cleaner 2	Score	4.98	4.53	4.48	4.12	4.47	4.97	4.58	4.60	4.97	6.04	5.96	5.49
	CD	0.38	*0.78*	*0.84*	0.69	*0.80*	0.74	*0.78*	*0.85*	0.72	0.92	0.72	*0.84*
Wall clock 1	Score	3.92	3.54	3.88	3.52	3.47	3.90	4.05	2.97	4.42	3.94	3.72	3.92
	CD	0.26	0.79	0.69	*0.78*	*0.72*	0.69	0.75	0.68	*0.80*	0.71	*0.72*	0.72
Wall clock 2	Score	3.96	4.95	4.52	5.47	5.79	5.16	3.20	3.45	5.04	2.14	2.48	2.94
	CD	0.32	0.75	*0.81*	*0.74*	0.80	0.73	0.79	*0.81*	0.72	0.83	*0.75*	0.72
Motorcycle 1	Score	6.08	5.57	5.89	5.18	5.67	5.13	5.15	5.93	5.58	4.16	4.55	4.94
	CD	0.28	*0.82*	0.72	0.68	*0.91*	0.72	0.71	0.69	*0.77*	0.74	*0.79*	0.67
Motorcycle	Score	5.73	5.11	5.18	5.14	5.40	5.02	5.12	5.14	5.05	3.67	4.12	4.08

		Beauty	**Ergonomics**	**Harmony**	**Balance**	**Proportion**	**Compactness**	**Elegance**	**Complexity**	**Neatness**	**Novelty ratio**	**Originality**	**Distinctiveness**
2	CD	0.32	0.71	0.73	0.69	*0.77*	0.72	0.67	0.76	0.74	*0.81*	0.78	0.72
Watering can 1	Score	3.12	4.03	3.55	3.94	3.90	3.92	3.02	3.06	3.92	2.57	2.92	2.95
	CD	0.23	0.75	*0.78*	0.72	0.69	0.73	0.75	0.78	0.71	*0.85*	0.69	0.73
Watering can 2	Score	5.31	5.18	5.10	5.05	4.96	4.92	6.05	4.14	5.01	5.42	5.17	5.15
	CD	0.22	0.73	0.71	0.72	0.68	0.72	0.87	0.74	0.73	*0.85*	0.72	0.75

Source: author's work results

Some assessment criteria have symbolic attributes. It is the case of functionality, origin of form, and temporal orientation. The percentages associated with these criteria are shown in Table 3. All attributes (except one) have percentage values above 70%, which indicates, again, that the criteria (respectively, the attributes) were well chosen, being efficient, reliable, and clear to use.

Table 3. Percentages for Symbolic Attributes in Study 1

%	**Functional**	**Non-functional**	**Geometric abstract**	**Organic abstract**	**Stylised**	**Nature-inspired**	**Avant-Gard**	**Present**	**Traditional**	**Retro**
Vacuum cleaner 1	**73.08**	26.92	10.77	3.85	4.62	**80.77**	**75.20**	20.00	3.20	1.60
Vacuum cleaner 2	**96.92**	3.08	**88.46**	0.77	10.00	0.77	**79.23**	13.08	3.85	3.85
Wall clock 1	**90.77**	9.23	**85.38**	5.38	9.23	0.00	8.46	**76.92**	10.00	4.62
Wall clock 2	**100**	0	**91.54**	1.54	4.62	2.31	0.77	10.00	**82.31**	6.92
Motorcycle 1	**97.69**	2.31	16.15	6.92	**73.85**	3.08	5.38	**89.23**	5.38	0.00
Motorcycle 2	**97.69**	2.31	15.38	9.23	**71.54**	3.85	2.31	6.15	10.00	**81.54**
Watering can 1	**92.31**	7.69	**90.77**	3.08	3.85	2.31	3.85	5.38	**86.92**	3.85
Watering can 2	**91.54**	8.46	2.31	**90.77**	5.38	1.54	**50.77**	41.54	3.08	4.62

Source: author's work results

4.3 Study 2

The second study was conducted with 151 participants (82 women and 69 men). The mean age was 24.48 years (*SD* = 5.97). All participants were students enrolled at a large technical university in Romania. No participant from the pre-test or Study 1 was involved in this study. The participants had basic training in product aesthetics. The participants were screened for visual deficiencies. The participants were not financially rewarded for their participation in this research. The product images were presented on computer screens, where appeared with a height of 8 cm. All computer monitors were of the same model and were properly calibrated. The assessment method and all the criteria were explained in-depth to the participants.

The accuracy of results was tested using *Z-score*. No *Z-scores* were outside the interval [-3; +3], so no data sets were eliminated. The *Z-score* values ranged between -2.19 and 2.55. The reliability of the data was tested using the Cronbach's alpha coefficient. The calculated value for the complete set of data was α = 0.913, value which stands for a very good reliability.

In the second study, the aim was not to replicate the first study using other products, but to test that the proposed method allows the same ordering of products from an aesthetic point of view as a verified method, namely FTESE. That is why the products used as case studies in the thesis (Crăciun, 2022) were ordered within each class according to the N_{FD} mark (the aesthetic indicator proposed by Crăciun). (The values of N_{FD} were taken from the thesis.) Thus, the most beautiful chair became Chair 1 and the one in the third position – Chair 3. To check if the same order is kept, the differences between the scores obtained by products in Study 2 were calculated for all numerical criteria. Obviously, the differences should be positive for method validation and also the difference between products 1 and 3 should be greater than the difference between products 1 and 2. The results are shown in Table 4.

Only three negative differences (out of 66) and five greater differences were observed between the first product and the second product than between the first product and the third product, indicating that this method is subtler than FTESE. Considering the data in Table 4, it follows that the method proposed in this paper is indirectly validated by comparison.

Table 4. Differences between scores in Study 2

Difference between …	Ergonomics	Harmony	Balance	Proportion	Compactness	Elegance	Complexity	Neatness	Novelty ratio	Originality	Distinctiveness
Chair 1 – Chair 2	0.09	0.15	-0.1	0.05	0.11	0.08	0.19	0.05	0.14	0.12	0.30
Chair 1 – Chair 3	0.43	0.59	0.43	0.36	0.45	0.60	0.28	0.56	0.62	0.38	0.52
Coffee Table 1 – Coffee Table 2	0.29	0.25	0.02	0.02	-0.1	0.07	0.28	0.32	0.42	0.36	0.17
Coffee Table 1 – Coffee Table 3	0.50	0.43	0.10	0.07	0.15	0.14	0.58	0.49	0.23	0.15	0.24
Bedside 1 – Bedside 2	0.46	0.14	0.06	0.30	0.07	0.61	0.27	0.23	0.09	0.05	0.08
Bedside 1 – Bedside 3	0.13	0.21	0.07	0.13	0.14	0.19	0.53	0.07	0.15	0.15	0.19

Source: author's work results

5. DISCUSSION

5.1 Theoretical Implications

The industrial designer and the product manager aim to create an industrial object with competitive product aesthetics. "Competitive" assumes that the product aesthetics contribute to the design objective as formulated in the design brief, but also to the materialisation of the human values and goals of the targeted market segment. The contribution to the design objective means that product aesthetics play a significant role in the safe operation of the product at competitive parameters, clear and easy use, efficient manufacturing, and increasing sales that bring profit to the producing company. When a consumer wants to buy a product, she/he considers, among other factors, the extent to which the product (through its aesthetics) expresses her/his human values and/or lifestyle goals.

Due to the fierce competition in today's world, the industrial designer and product manager should contribute to the rapid launch of a viable product to the market. There is no time for major mistakes and for going back to square one. The two professionals should assess the product aesthetics several times during product development. Therefore, they need a method that can be easily applied, quickly understood by the representatives of the market segment invited to participate in the product design, and that also offers a nuanced assessment. Unlike other methods that use a very small number of criteria (even three), the "Assessment of adequacy of product appearance attributes to the design objective and to values of market

segment" method (Adequacy Method, in short) uses a reasonable number of criteria, with a structure of the criteria system resulted from the application of complex and reliable statistical methods (Dumitrescu & Crăciun, 2019). Furthermore, the proposed method was indirectly validated by comparing it with another assessment method with proven efficiency. The criteria and associated attributes proved to be easy to understand and apply, a fact demonstrated by the high values of the measure of correct decision for the numerical criteria and the high percentages obtained for the criteria with symbolic attributes.

5.2 Practical Implications

The author proposes a useful method, sufficiently complex, easy to understand and to apply by non-professionals. The Adequacy Method has the following phases:

1. The objective of the design process is clarified.
2. The market segment identified by the design brief is deepened.
3. The human values / goals valued by the market segment are determined. It can be Kahle's LOV or Young & Rubicam's goals or something similar.
4. The desirable attribute is identified for each criterion (harmonious or disharmonious, for example), considering the perspective of its contribution to the fulfilment of the design objective and to the materialisation of the values / goals of the market segment. This leads to the drafting a list of desirable attributes.
5. A representative sample from the market segment is selected to be involved in the assessment.
6. Each member of the sample assesses the product aesthetics with the help of the questionnaire (see the Appendix). (It is recommended to use the 7-point Likert scale.)
7. The results are centralised, and descriptive statistics are performed.
8. If the average score obtained for a numerical criterion is in the range [3.5; 4.5], then it is considered that the criterion is not significant for the product aesthetics. (The indicated range values are valid for the 7-point Likert scale.)
9. If the average score for the respective criterion is closer to the desired attribute, then a "plus" is awarded. If not, a "minus" is given. (Practically, if it is above 4.5 or below 3.5, for a Likert scale of 7.)
10. In the case of criteria with symbolic attributes, the attribute that exceeds the 50% threshold is chosen. If no attribute exceeds the threshold, it is considered that the criterion is not significant for the aesthetics of that product. If the chosen attribute is the desired one, then a "plus" is awarded...
11. Add up all the "pluses" and all the "minuses" and get the product's aesthetic score. If the score is negative, it is obvious that the product aesthetics is totally inappropriate and should be reconsidered.

Note: The final score has no intrinsic value, but only allows the product aesthetics to be compared with the aesthetics of another product in the same class and intended for the same market segment.

6. CONCLUSIONS

The author previously proposed an industrial design assessment method called "Assessment of adequacy of product appearance attributes to the design objective and to values of market segment", whose system of criteria resulted by applying complex statistical methods to experimental data. Later, the author formulated two research objectives (see §3. Research design and methodology) that constitute the starting point of the present research. In relation to these two research objectives, the conclusions are as follows:

- It was demonstrated that the Adequacy Method is efficient and clear for the experiment participants, a fact proved by the high values of measure of correct decision for numerical criteria and the high percentages obtained for criteria with symbolic attributes.
- The Adequacy Method led to the same ordering of products based on their aesthetics as the FTESE Method, but proved to be more nuanced.

As for the limitations of the study and future research directions, the following can be stated. The method was tested with the help of young intellectuals. It remains to be verified if the method is equally effective in the case of mature and senior persons and/or from other social categories, considering that a product's market segment can be from any social category. The method was verified in the case of five product classes: vacuum cleaners, wall clocks, motorcycles, watering cans, and furniture. Future direction of research aims at testing the method for other classes of products, focusing on more general criteria for categorising products, such as high-tech, low-tech, etc.

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APPENDIX

The questionnaire used in all studies:
Assess the beauty of product X (7-point Likert scale)
Evaluate product X by the functionality criterion. (options: functional / non-functional)
Evaluate product X by the ergonomics criterion. (7-point Likert scale)
Evaluate product X by the harmony criterion. (7-point Likert scale)
Evaluate product X by the balance criterion. (7-point Likert scale)
Evaluate product X by the proportion criterion. (7-point Likert scale)
Evaluate product X by the compactness criterion. (7-point Likert scale)
Evaluate product X by the elegance criterion. (7-point Likert scale)
Evaluate product X by the complexity criterion. (7-point Likert scale)
Evaluate product X by the neatness criterion (7-point Likert scale)
Evaluate product X by the novelty ratio. (7-point Likert scale)
Evaluate product X by the originality criterion. (7-point Likert scale)
Evaluate product X by the distinctiveness criterion (7-point Likert scale)
Evaluate product X by the criterion origin of form. (options: geometric abstract / organic abstract / stylised / nature-inspired)
Evaluate product X by the temporal orientation criterion. (options: avant-gard / present / traditional / retro)