STRATEGIC DESIGN RESEARCH JOURNAL

Extending the Construct of Centrality of Visual Product Aesthetics

Andrei Dumitrescu [a] *

[a] POLITEHNICA University of Bucharest, TCM Department: Bucharest, Romania.
* Corresponding author: andrei.dumitrescu@upb.ro

ABSTRACT

The concept of Centrality of Visual Product Aesthetics (CVPA) and the associated construct were introduced to measure the level of significance that product design has for certain consumers. The aim was that, after identifying consumers with high CVPA, designers and manufacturers can successfully address to them products with a remarkable design. The initial construct proposed by other researchers was composed by three factors (Value, Acumen and Response). The author of this paper aimed to amplify the construct and tested a new construct containing four additional new factors: Brand Loyalty, Product Involvement, Personality Congruence and Price Indifference. After applying Exploratory Factor Analysis, it was found that practically the Value and Brand Loyalty items were part of the same factor. The same situation was encountered for Response and Personality Congruence. After removing the less significant items, a new construct resulted, validated by Confirmatory Factor Analysis. The new construct has been used successfully to test the hypothesis that people with high CVPA attach special importance to products with a high aesthetic content (in the case of loudspeakers).

Keywords: Centrality of Visual Product Aesthetics, Industrial Design, Product Aesthetics.

INTRODUCTION

Globalization, sustained technological progress and the worldwide spread of quality systems have led to a very high level of economic competition. Companies in any field strive to find a powerful competitive edge. One of the approaches addressed in this quest is to differentiate products from those of competitors. By and large, there are two related possibilities: differentiation by brand and differentiation by design (product aesthetics). Apparently, design differentiation should work very well, because products with a remarkable design stand-out in their class, and this is easy to observe visually (and not only). The question is how effective design differentiation really is. Are all market segments and niches sensitive to outstanding design? Even from a strictly logical point of view, the answer is obviously no, because people are essentially different. People (market segments) who are sensitive to the aesthetics of the product should be identified by an objective and efficient method in order to use the design differentiation.

Thus appeared the concept of Centrality of Visual Product Aesthetics (CVPA) introduced by Bloch et al. (2003), a concept meant to indicate “the level of significance that visual aesthetics hold for a particular consumer in his / her relationship with products". By applying this

concept and the associated methodology, one can identify people with high level of CVPA and those with low level of CVPA.

Obviously, people with high CVPA are the ones who are interested in buying a product with a remarkable design (high level of product aesthetics). Apart from the fact that these people have an innate inclination for beautiful objects, they have also acquired (formally, but especially informally) considerable knowledge in the area of product aesthetics. For example, these people are familiar with the concept of perfect proportion (Dumitrescu, 2009; Meisner, 2018; Liu & Zhang, 2019), have knowledge of colour theory (Corvette, 2016; Best, 2017), and are aware of aesthetic phenomena like visual pollution (Dumitrescu, 2001; Ahmed et al., 2019).

The concept proposed by Bloch et al. (2003) included four factors: Value (the value that a consumer assigns to product appearances in enhancing personal and even societal well-being), Acumen (the acumen or the ability to recognize, categorize, or evaluate product designs), Response (the level of response to visual design aspects of products) and Determinance (the determinance of visual aesthetics in affecting product preferences and purchase satisfaction). After applying several statistical methods, the three researchers concluded that determinance is not a significant factor and removed it from the construct.

The concept has been successfully applied in fashion industry (Workman & Caldwell, 2007), in web design (Pengnate, et al., 2019), gastronomy (Paaki, et al., 2019) and in neuroscience (Huang et al., 2020). The effect of CVPA on price sensitivity was studied and it was found that the relationship is negative, so people with high CVPA are not interested in low prices (Mumcu & Kimzan, 2015).

On a first inspection, the current CVPA construct is statistically sound, but the question is whether it is truly all-encompassing. It should be explored whether there are other factors relevant to the CVPA in order to improve the construct.

1. EXPERIMENT CONCEPTION

After the analysis of the specialised literature, the following research objectives were formulated:

- Proposal of a more comprehensive model for CVPA.
- Testing the hypothesis that people with a high CVPA appraise greater products with a high aesthetic content than people with a low CVPA, in the case of electronic products.

In order to investigate the differences between the assessments made by people with high CVPA and those made by people with low CVPA, the following null hypotheses were chosen:

1. Regardless of the CVPA level, the way people appreciate product aesthetics is the same.
2. Regardless of the quality of product aesthetics, the way people appreciate products is the same.
3. There is no interaction between the CVPA level and the product aesthetics quality in the assessment of products.

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

After a careful analysis of the proposed construct of CVPA by Bloch et al. (2003), it was concluded that such a construct should be more complex and should contain other factors than the three proposed (Value, Acumen and Response). The following additional factors were under scrutiny: a) Brand Loyalty; b) degree of Product Involvement; c) Personality / Identity Congruence; d) Indifference to the Price of the product; e) the Context of Purchase (directly in the store; ordered from catalogue; online from virtual stores); f) consumer's Lifestyle; g) consumer's Aesthetic Education.

Following the analysis, it turned out that the purchase context does not allow an objective assessment of product aesthetics under identical conditions, because purchasing directly from the store involves direct contact with product aesthetics, while online purchase involves contact with an image of the product, often at a low resolution. Consumer's lifestyle is difficult to measure and, for an objective and complete assessment, would greatly complicate the construct. Also, consumer's aesthetic education is difficult to measure, because in formal and informal education there are many types of programmes and, again, this parameter would complicate the construct.

The items used previously for the first three factors were retained. There were identified in scientific literature constructs for most of the other factors. But these constructs tended to be exhaustive and if assembled they would lead to a complicated construct. So, it was decided to use only three items per factor and these items to be inspired by the existing constructs. These sources of inspiration were in the field of: brand loyalty (Moolla & Bisschoff, 2012; Rather & Sharma, 2017); product involvement (McQuarrie & Munson, 1992; Kim, et al., 2017; Roe & Bruwer, 2017); personality congruence (Govers & Schoormans, 2005; Bajac et al., 2018) and price (Mumcu & Kimzan, 2015; Kryszak, & Wang, 2020). The resulted questionnaire is presented in Appendix 1. It was structured using a 5-point Likert scale (1 – Totally disagree; 5 – Totally agree).

The proposed construct (and improved after running the experiment) should allow the ranking of people according to CVPA level. In order to verify the hypothesis that there were differences between people with high CVPA and those with low CVPA, there were chosen, after several trials, the two loudspeakers shown in Figure 1, characterized by low aesthetics and high aesthetics, respectively.

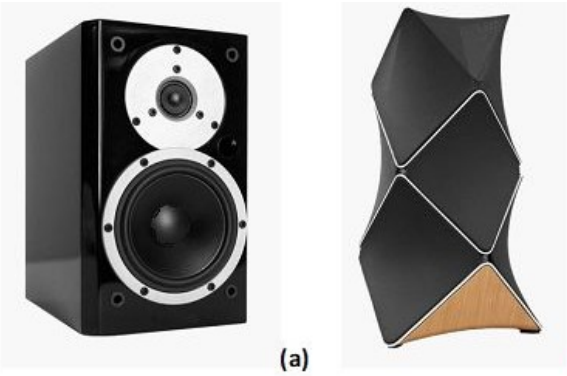

Figure 1. Loudspeakers used in experiment (a – low aesthetics; b – high aesthetics).

The following questions were used for the aesthetic assessment of the loudspeakers by the experiment participants (7-point Likert scale):

- How beautiful is the speaker?
- How much do you like the speaker?

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

- How much would you like to buy the speaker?

Because of the nature of the experiment (which includes the Balanced Inventory of Desirable Responding Short Form - BIDR-16), the author requested the approval of the department management to conduct the experiment. After examining all the details of the experiment, the management of the department approved the author's request.

2. EXPERIMENTAL RESULTS

The experiment was carried-out with 388 participants (230 female and 158 male participants). All participants were students enrolled at a large technical university in Romania. The students were not financially rewarded for their participation in this experiment. Several online sessions of the experiment were organised. During each session, the author was connected online with the participants through a business communication platform. Each session had the following structure: 1. The author made an introduction in which he presented to the participants the purpose and the methodology of the experiment and assured the participants that the data entered by them will be accessible only to the author and will not be shared in any way. 2. Participants filled online the same questionnaire through a survey administration software. They evaluated the same two products (displayed as digital images). 3. After each session, the data was transferred from the survey administration software to a software spreadsheet. At the end of all sessions, all data was processed offline with the respective spreadsheet software.

In order to check the accuracy of results, the Z-score was calculated separately for the responses given by participants to Centrality of Visual Product Aesthetics questions and for the responses given to aesthetic assessment of loudspeakers. The Z-scores of two participants (1 female and 1 male) were outside the values of [-3, +3], so their responses were eliminated. Afterwards, the Z-score ranged between -2.96 and 2.66 for Centrality of Visual Product Aesthetics responses and between -2.73 and 2.75 for aesthetic assessment responses. So, all the remaining results were considered accurate.

The reliability of data was tested using the Cronbach's alpha coefficient. The calculated value for the whole set of data was $\alpha = 0.82$, value which stands for a good reliability.

The social desirability was tested using the Balanced Inventory of Desirable Responding Short Form (BIDR-16) (Hart et al., 2015). This test incorporates two parts: Self-Deceptive Enhancement (honest but overly positive responding) and Impression Management (bias toward pleasing others), each part with 8 questions. The test was administered to all participants to experiment.

The correlation coefficient between individual experimental results (responses to questionnaire) and BIRD-16 results was calculated. The result ($r = 0.055$) indicated that social desirability bias did not alter the significance of experimental results.

The Exploratory Factor Analysis (EFA) method was applied to responses to questionnaire. The assumptions for EFA were checked and validated. For the determination of the number of factors, the parallel analysis (promax oblique rotation) and scree plots were used. They indicated constructs of 5 and, respectively, 4 factors. Afterwards, the constructs with 4 and respectively 5 factors were tested, but the 4-factor construct achieved inferior values of the adequacy indices. The factors' loadings for 5 factors are displayed in Table 1. (The threshold for factor loadings was set to 0.4.) The Chi-squared test value was 491.8 ($df = 148$, $p < 0.001$).

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

The RMSEA (Root Mean Square Error of Approximation) was 0.079, indicating a good fit for 90% confidence. It was noticed in the table that the items corresponding to Value 1, Value 4 and Personality Congruence 3 have factor loadings below the threshold, respectively 0.4. Consequently, these items were removed from construct.

An interesting observation is that Factor 1 grouped all items associated with the Value and Brand Loyalty categories, as well as the Price Indifference 1 item. The explanation was that for most people the value associated with the products also included brand loyalty. Additionally, the Price Indifference 1 item contained the expression "a special product", which meant that by considering the product as special, a person gave it a certain value.

Table 1. Factor Loadings resulted after Exploratory Factor Analysis

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Uniqueness
Value 1						0.617
Value 2	0.547					0.715
Value 3	0.459					0.579
Value 4						0.636
Acumen 1			0.658			0.554
Acumen 2			0.796			0.446
Acumen 3			0.556			0.630
Acumen 4			0.543			0.672
Response 1		0.754				0.592
Response 2		0.758				0.499
Response 3		0.588				0.578
Brand Loyalty 1	0.427					0.751
Brand Loyalty 2	0.610					0.579
Brand Loyalty 3	0.636					0.601
Product Involvement 1				0.656		0.553
Product Involvement 2				0.674		0.433
Product Involvement 3				0.530		0.619
Personality Congruence 1		0.442				0.564
Personality Congruence 2		0.543				0.516
Personality Congruence 3						0.621
Price Indifference 1	0.647					0.581
Price Indifference 2					0.739	0.474
Price Indifference 3					0.593	0.633

Note: Applied rotation method is promax.

Similar to Factor 1, Factor 2 gathered all items associated with the Response and Personality Congruence categories. Moreover, a person's finding that the product personality converged towards the personality of the observer will trigger a psychological response of satisfaction. Each of the last three factors contained items associated with distinct categories.

Because the first factors contained items from distinct categories, the variants for the factor name were analysed. It was decided that Value + Brand Loyalty = Aesthetic Pleasure and Loyalty (Factor 1), because the remaining items were focused on the notion of pleasure

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

(aesthetics) and brand loyalty had an important aesthetic component. Because personality congruence can also be considered a response, the name Response for Factor 2 has been retained.

It should be noted that even after the elimination of the 3 items mentioned above, there were still 20 items, i.e. many. It was necessary to reduce the number of items so that those who will answer the questionnaire will not get bored and either give up or give quick and superficial answers to finish faster.

Afterwards, Confirmatory Factor Analysis (CFA) was applied to a different data set than the one used for EFA and after removing the values corresponding to Value 1, Value 4 and Personality Congruence 3. The examination of the results indicated that the fit indices had inappropriate values, even if the p-value was appropriate.

Given that it had already been decided after the EFA to reduce the number of items, all the items came under scrutiny, especially those of factors with many items. It was preferred to analyse the significance of each item and its relevance for the associated factor to the detriment of eliminating items based only on low factor loadings. Thus, the following items were eliminated: Brand Loyalty 1; Brand Loyalty 3; Price Indifference 1; Response 2; and Acumen 4. The resulting construct is presented in Appendix 2.

Confirmatory Factor Analysis was applied again to the same data set previously used and results are presented in the Table 2. The Chi-squared test value was 136.2 (df = 80, p< 0.001). The RMSEA (Root Mean Square Error of Approximation) was 0.047; CFI (Comparative Fit Index) = 0.93; TLE (Tucker Lewis Index) = 0.91; all indicating a good fit.

Next, the CVPA score was calculated taking into account only the values from the items remaining in the construct. The average CVPA score was 3.55 (Var = 0.29). Then, the data were ordered based on the CVPA score obtained by the experiment participants. In order not to be biased by the continuity of the CVPA score, the records of midway participants were eliminated. It was decided that the number of participants removed from these calculations would be small, because a large amount of deleted data would have polarized the results, artificially increasing the probability that the hypothesis of different assessment would be confirmed.

Table 2. Confirmatory Factor Analysis results

Factor	Indicator	*Estimate*	*Std. Error*	*Z-value*	*p*
Aesthetic Pleasure and Loyalty	Value 2	0.314	0.040	7.789	< .001
	Value 3	0.635	0.071	8.954	< .001
	Brand Loyalty 2	0.374	0.167	2.237	0.002
Response	Response 1	0.395	0.073	5.385	< .001
	Personality Congruence 1	0.772	0.059	13.186	< .001
	Personality Congruence 2	0.634	0.056	11.324	< .001
	Response 3	0.483	0.119	4.043	< .001
Acumen	Acumen 1	0.612	0.058	10.567	< .001
	Acumen 2	0.707	0.063	11.311	< .001
	Acumen 3	0.508	0.056	9.016	< .001
Product Involvement	Product Involvement 1	0.550	0.062	8.809	< .001

Factor	Indicator	*Estimate*	*Std. Error*	*Z-value*	*p*
	Product Involvement 2	0.746	0.063	11.832	< .001
	Product Involvement 3	0.733	0.077	9.510	< .001
Price Indifference	Price Indifference 2	1.204	0.426	2.826	< .001
	Price Indifference 3	0.594	0.217	2.743	< .001

In order to verify if there was a noticeable difference between the assessments performed by the people with high CVPA and those with low CVPA, the scores given to the two loudspeakers were analysed. Thus, the data obtained from the first 180 participants with high CVPA (MCVPA = 4; Var = 0.09) and, respectively, from the last 180 participants with low CVPA (MCVPA = 3.09; Var = 0.12) remained.

An analysis of the variance was performed based on a 2x2 experiment design. The first parameter was the CVPA level, respectively high CVPA and low CVPA. The second parameter was the average of the scores awarded (to the three questions) obtained by the two loudspeakers. Two-way ANOVA was applied, and the results are shown in Tables 3 and 4.

Table 3. Two-way ANOVA results

	Loudspeaker 1	Loudspeaker 2	Total	Difference L2 - L1
High CVPA				
Average	3.85	5.09	4.47	1.24
Variance	2.06	2.43	2.63	
Low CVPA				
Average	3.79	4.60	4.19	0.81
Variance	2.06	2.17	2.27	

Table 4. Null hypotheses testing

F (1, 719)	*p-value (<0.05)*	*F crit*	**Decision**
6.530403	0.01081	3.854479	*The H1 null hypothesis was rejected.*
87.06403	1.29E-19	3.854479	*The H2 null hypothesis was rejected.*
3.935653	0.047654	3.854479	*The H3 null hypothesis was rejected.*

The results confirmed the product aesthetics manipulation. In order to visually highlight the differences in the assessment of aesthetics, the processed data were presented in Figure 2. It was observed that regarding the loudspeaker with low aesthetic level, all participants assessed the product almost equally (mean score = 3.8). In contrast, the product with a high aesthetic level was evaluated differently by the two categories of participants, those with a high CVPA gave higher scores (mean score = 5.1).

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

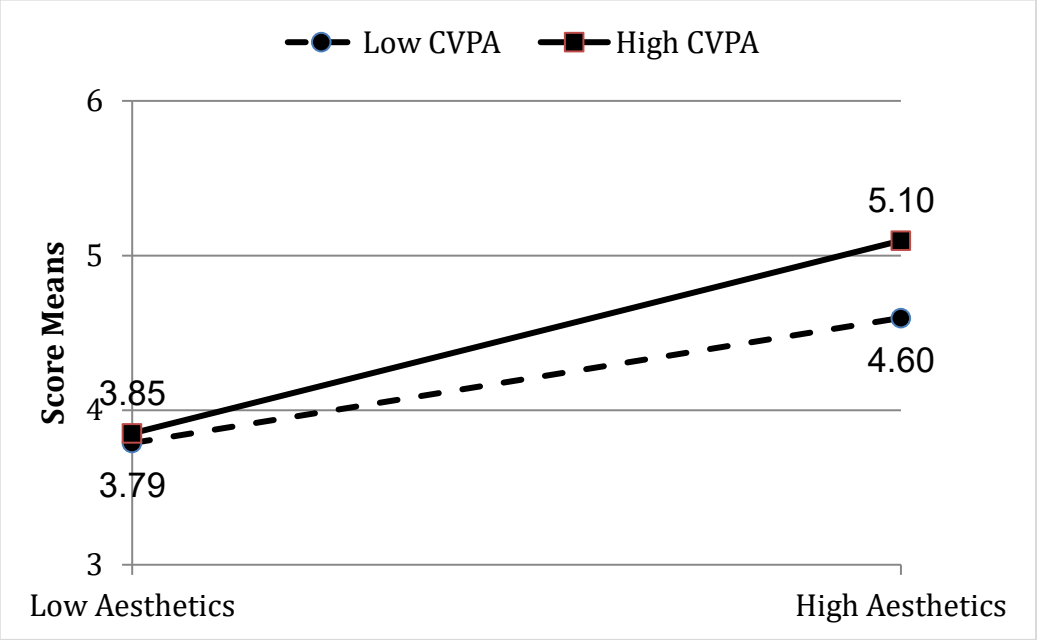

Figure 2. The effect of CVPA on assessment of product aesthetics.

All of the above confirmed the assumption that people with a high CVPA appreciated and were impressed by products with a remarkable design. It should not be ignored that, in this experiment, a component of this appreciation was the intention to buy.

3. DISCUSSION

The concept of Centrality of Visual Product Aesthetics (CVPA) was introduced to identify the segments of the population that have a special relationship with product aesthetics and, consequently, are more inclined to purchase a product with a remarkable design. However, the CVPA cannot be applied directly to the market in its entirety and, therefore, a prior segmentation would be required according to another criterion (demographic, etc.). The concept of CVPA and the associated construct has been applied by various researchers in several fields and has proved useful.

The author questioned whether the initial CVPA really captured all situations and included all relevant factors. Thus, two research objectives were formulated: proposal of a new construct (more comprehensive) and verification the hypothesis that people with high CVPA were more "impressed" by products with a remarkable design in case of electronic products, namely loudspeakers - products placed in the main area of the household and in addition associated to entertainment, so products for which industrial design was very important. Bloch et al. (2003) checked the construct in the case of toasters - electrical products usually placed in a secondary area of the house - kitchen. Therefore, the importance of industrial design in their structure was also secondary.

The following factors were analysed as candidates for the new construct: a) brand loyalty; b) degree of product involvement; c) personality / identity congruence; d) indifference to price of the product; e) the context of purchase (directly in the store; ordered from catalogue; online from virtual stores); f) consumer's lifestyle; g) consumer's aesthetic education. The context of purchase, consumer's lifestyle and consumer's aesthetic education were removed due to various objective reasons. Three items inspired by different dedicated constructs were generated for each of the remaining additional factors. In the first proposed construct, the factor items used by Bloch (2003) were introduced, to which the new generated items

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

were added. Apart from the CVPA construct, three items were generated for measuring the appraisal of the two loudspeakers given by the experiment participants. Three null hypotheses were established in order to test the second research objective.

After conducting the experiment with a number of participants significant for the educated young population, the data collected were verified in terms of accuracy and reliability. Afterwards, all participants were given a Balanced Inventory of Desirable Responding Short Form (BIDR-16) (Hart et al, 2015) to remove the risk that the results would be biased by social desirability. Analysis of the correlation between the results of BIRD-16 and the results of the main experiment revealed that the social desirability bias did not act, so the results of the main experiment were conclusive.

Exploratory Factor Analysis was applied and it was found that three items were not relevant (two from the original construct) and were removed. It was also found that the number of items was too large and should be reduced. Interesting observations (and easily explainable by logic) were that Value and Brand Loyalty associated items were grouped under the same factor and, similarly, Response and Personality Congruence associated items can be grouped together. The new factors were called Aesthetic Pleasure and Loyalty and, respectively, Response. The factors Acumen, Product Involvement and Price Indifference were confirmed to be relevant and apart. By the proved integration of the Price Indifference factor in the new construct, the discoveries of Mumcu and Kimzan (2015) were confirmed.

Confirmatory Factor Analysis was used for construct validation. In a first phase, fit indices did not have proper values. Then, five items were removed based on their semantically low relevance. Applying Confirmatory Factor Analysis again led to the authentication of the new construct, all indicators having proper values.

After separating the participants with high CVPA from those with low CVPA (and eliminating those from the middle), the null hypotheses were checked using the scores obtained by the two loudspeakers. Two-way ANOVA was applied, resulting in the rejection of all three null hypotheses. Thus, product aesthetics manipulation was confirmed. So, people with high CVPA are much more sensitive to products with outstanding design, with a higher aesthetic content. It should be noted that the loudspeaker with a modest aesthetic content was assessed very similarly by the two categories of participants.

The research described in the paper had some limitations. First, the participants in the experiment were students at a university in Romania. Thus, the conclusions are valid for the educated young population. It must also be stated that Romania belongs culturally to the Central-Eastern European area. Second, the products used as the subject of this experiment were loudspeakers, respectively electronic products that were placed in the main area of the household and in addition associated with entertainment, so products for which industrial design was very important.

Future research directions are related to the practical testing of the construct. The author will contact practitioners in the field of product aesthetics and invite them to test the construct. The tests will probably lead to the practical validation of the construct and to its improvement based on the suggestions made by professionals in the field and also based on new data. To the extent that many professionals can be involved, the data obtained would be classified according to the entity who applied the construct: free lancers, design consultancy firms and large manufacturing companies.

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

4. CONCLUSIONS

Centrality of Visual Product Aesthetics (CVPA) concept was introduced on the assumption that people with high CVPA develop a special relationship with products possessing an outstanding design (high aesthetic content). This hypothesis was tested by initial researchers using a particular class of products (toasters).

The initial construct proposed by other researchers had three factors (Value, Acumen and Response) and this generated the doubt that not all the relevant factors were included. New factors were introduced: Brand Loyalty, Product Involvement, Personality Congruence and Price Indifference. The EFA indicated that Brand Loyalty and Value can be unite in a single factor and so Personality Congruence and Response. Finally, a new construct of CVPA was obtained. The essential hypothesis that generated the very existence of CVPA was tested and confirmed using the new construct in the case of a very special class of products (loudspeakers).

REFERENCES

Ahmed, N., Islam, M. N., Tuba, A. S., Mahdy, M. R. C., & Sujauddin, M. (2019). Solving visual pollution with deep learning: A new nexus in environmental management. *Journal of environmental management*, 248, 109253. DOI: 10.1016/j.jenvman.2019.07.024

Bajac, H., Palacios, M. and Minton, E.A. (2018). Consumer-brand congruence and conspicuousness: an international comparison. *International Marketing Review,* 35(3): 498-517. DOI: 10.1108/IMR-12-2016-0225

Best, J. (Ed.). (2017). *Colour design: theories and applications*. Philadelphia: Woodhead Publishing.

Bloch, P. H., Brunel, F. F., & Arnold, T. J. (2003). Individual differences in the centrality of visual product aesthetics: Concept and measurement. *Journal of consumer research*, 29(4): 551-565. DOI: 10.1086/346250

Corvette, M. N. A. (2016). *Consuming Colour: A Critical Theory of Colour Concerning the Legality and Implications of Colour in Public Space* (Doctoral dissertation). Goldsmiths, University of London.

Dumitrescu, A., & Manolache, D. (2001). Poluarea vizuală. *Revista de Ecologie Industrială*, 1:36-43. Retrieved December 13, 2021 from https://www.researchgate.net/profile/Andrei-Dumitrescu-3/publication/338685391_POLUAREA_VIZUALA/links/5e2486aba6fdcc101578111e/POLUAREA-VIZUALA.pdf

Dumitrescu, A. (2009). Experiment for the rediscovery of the perfect proportion of rectangle. *Scientific Bulletin, Series A, Applied Mathematics and Physics*, 71(1): 33-42. Retrieved December 13, 2021 from https://www.scientificbulletin.upb.ro/rev_docs_arhiva/full7249.pdf

Govers, P. C., & Schoormans, J. P. (2005). Product personality and its influence on consumer preference. *Journal of Consumer Marketing*, 22(4): 189-197. DOI: 10.1108/07363760510605308

Hart, C. M., Ritchie, T. D., Hepper, E. G., & Gebauer, J. E. (2015). The Balanced Inventory of Desirable Responding Short Form (BIDR-16). *Sage Open*, 5(4). 2158244015621113. DOI: 10.1177/2158244015621113

Huang, J., Sun, Y., & Wan, X. (2020). Gender Differences in the Associations Between Gray Matter Volume and the Centrality of Visual Product Aesthetics. *Neuroscience*, 431: 64-72. DOI: /10.1016/j.neuroscience.2020.01.038

Kim, S., Kim, J., & Kim, E. (2017). Metaphor as visual thinking in advertising and its effects: focus on brand familiarity and product involvement. *Journal of Promotion Management*, 23(5): 654-672. DOI: /10.1080/10496491.2017.1297982

Kryszak, M., & Wang, L. W. (2020). The value of aesthetics in the BIPV roof products segment: a multiperspective study under European market conditions. *Energy Sources, Part A:*

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

Recovery, Utilization, and Environmental Effects, 1-22. DOI: 10.1080/15567036.2020.1807656

Liu, Y., & Zhang, Q. (2019). Interface design aesthetics of interaction design. In *International Conference on Human-Computer Interaction* (pp. 279-290). Springer. DOI: 10.1007/978-3-030-23570-3_21

McQuarrie, E. F., & Munson, J.M. (1992). A Revised Product Involvement Inventory: Improved Usability and Validity, in Sherry, J. F. & Sternthal, B. (Eds.), *Advances in Consumer Research*, 19: 108-115.

Meisner, G. B. (2018). *The Golden Ratio: The Divine Beauty of Mathematics*. Race Point Publishing.

Moolla, A., & Bisschoff, C. (2012). A Model to Measure the Brand Loyalty for Fast Moving Consumer Goods, *Journal of Social Sciences*, 31(1): 71-85, DOI: 10.1080/09718923.2012.11893016

Mumcu, Y., & Kimzan, H. S. (2015). The effect of visual product aesthetics on consumers' price sensitivity. *Procedia Economics and Finance*, 26: 528-534. DOI: 10.1016/S2212-5671(15)00883-7

Paakki, M., Aaltojärvi, I., Sandell, M., & Hopia, A. (2019). The importance of the visual aesthetics of colours in food at a workday lunch. *International Journal of Gastronomy and Food Science*, 16, 100131. DOI: 10.1016/j.ijgfs.2018.12.001

Pengnate, S. F., Sarathy, R., & Arnold, T. J. (2019). The influence of the centrality of visual website aesthetics on online user responses: Measure development and empirical investigation. *Information Systems Frontiers*, 1-18. DOI: /10.1007/s10796-019-09957-3

Rather, R.A. & Sharma, J. (2017), The effects of customer satisfaction and commitment on customer loyalty: Evidence from the hotel industry. *Journal of Hospitality Application and Research*, 12(2): 41-60. Retrieved December 13, 2021 from https://www.academia.edu/download/60756285/320191001-104144-dd1gle.pdf

Roe, D., & Bruwer, J. (2017), Self-concept, product involvement and consumption occasions: Exploring fine wine consumer behaviour, *British Food Journal*. 119(6): 1362-1377. DOI: 10.1108/BFJ-10-2016-0476

Workman, J. E., & Caldwell, L. F. (2007). Centrality of visual product aesthetics, tactile and uniqueness needs of fashion consumers. *International Journal of Consumer Studies*, 31(6): 589-596. DOI: 10.1111/j.1470-6431.2007.00613.x

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

APPENDIX 1

The questionnaire administered to experiment participants

VALUE

Value 1: Owning products that have superior designs makes me feel good about myself.

Value 2: I enjoy seeing displays of products that have superior designs.

Value 3: A product design is a source of pleasure for me.

Value 4: Beautiful product designs make our world a better place to live.

ACUMEN

Acumen 1: Being able to see subtle differences in product designs is one skill that I have developed over time.

Acumen 2: I see things in a product design that other people tend to pass over.

Acumen 3: I have the ability to imagine how a product will fit in with designs of other things I already own.

Acumen 4: I have a pretty good idea of what makes one product look better than its competitors.

RESPONSE

Response 1: Sometimes the way a product looks seems to reach out and grab me.

Response 2: If a product design really "speaks" to me, I feel that I must buy it.

Response 3: When I see a product that has a really great design, I feel a strong urge to buy it.

BRAND LOYALTY

Brand Loyalty 1: I always buy the same brand for many product categories.

Brand Loyalty 2: I am proud of the my product brands.

Brand Loyalty 3: I am convinced that behind a well-known brand is a high level of quality.

PRODUCT INVOLVEMENT

Product Involvement 1: I like to find out how a certain product is made.

Product Involvement 2: I like to make detailed comparisons between products of the same kind.

Product Involvement 3: I read carefully the articles written by experts about the products that interest me.

PERSONALITY CONGRUENCE

Personality Congruence 1: I like to think that the products that belong to me express my identity.

Personality Congruence 2: I love products that have the same personality as mine.

Personality Congruence 3: My personal products increase my prestige in front of friends and colleagues.

PRICE INDIFFERENCE

Price Indifference 1: It is worth paying a higher price for a special product.

Price Indifference 2: I am not interested in the products that have the lowest price in their category.

Price Indifference 3: The low price of a product probably hides major quality deficiencies.

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03

APPENDIX 2

The new construct / questionnaire

AESTHETIC PLEASURE AND LOYALITY

I enjoy seeing displays of products that have superior designs.

A product design is a source of pleasure for me.

I am proud of my product brands.

RESPONSE

Sometimes the way a product looks seems to reach out and grab me.

When I see a product that has a really great design, I feel a strong urge to buy it.

I like to think that the products that belong to me express my identity.

I love products that have the same personality as mine.

ACUMEN

Being able to see subtle differences in product designs is one skill that I have developed over time.

I see things in a product design that other people tend to pass over.

I have the ability to imagine how a product will fit in with designs of other things I already own.

PRODUCT INVOLVEMENT

I like to find out how a certain product is made.

I like to make detailed comparisons between products of the same kind.

I read carefully the articles written by experts about the products that interest me.

PRICE INDIFFERENCE

I am not interested in the products that have the lowest price in their category.

The low price of a product probably hides major quali

Dumitrescu, A. (2021), Extending the Construct of Centrality of Visual Product Aesthetics. *Strategic Design Research Journal*. Volume 14, number 03, September – December 2021. 484-496. DOI: 10.4013/sdrj.2021.143.03