

NATURAL STONES AND CERAMIC TILES IMITATIONS: COMPARISON OF CONSUMERS' PERCEPTUAL RESPONSE USING PRODUCT SEMANTICS

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ABSTRACT

In the flooring and covering sector, ceramic tiling faces many other different materials competing for market share, like natural stones. More and more, technological advances allow ceramic materials to improve their ability to imitate natural stones. This factor jointly with the features inherent to ceramic materials (price, variability, availability, hygiene, etc.) involves a relevant competitive advantage. Therefore, manufacturers pursue obtaining reliable imitations of natural stones, trying to generate the same emotional responses.

Present study is focused on comparing the emotional response generated by natural stones and ceramic imitations by means of product semantics. Eleven ceramic materials and six natural stones, including granite, marble and slate were used to configure the sample of products. A sample of twenty consumers evaluated the sample using 13 emotional concepts. A question regarding product preference was also included to obtain the emotional concepts that have an influence on it.

An analysis of variance has been performed with the type of flooring as a factor. It shows that there are significant differences between natural stones and ceramics tiles in seven emotional concepts. Ceramic tiles obtain higher scores in concepts such as *innovative*, *comfortable* and *elegant*. Nevertheless ceramic tiles have lower scores in concepts related to

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resistance and *handcrafted*). No differences appear in basic concepts as *hygienic*, *practical* and *high quality*. A binary logistic regression has been applied to analyze the product preference. It shows that three concepts have a significant influence on consumers' preference: *comfortable*, *elegant* and *sober*.

It can be concluded that ceramic imitations differs from natural stones perceptions in some emotional concepts. Ceramic tiles improve the results of natural stones in the most relevant concepts related to consumers' preference. Nevertheless there is room for improvement in ceramics tiles. The main challenge is to improve the conveyance of messages of basic properties of coverings like resistance. Furthermore, ceramic claims widely used by manufactures such as hygienic advantage have not been detected by consumers. This fact should force manufactures to find the way to convey consumers such a crucial property perception.

Keywords: *Product semantics, aesthetics, symbolic values*

1. INTRODUCTION

Offering something different is crucial to team developers in most of today's industries because consumers have become more exigent; they always demand "newer and better" products [1]. Therefore, in traditional sectors such as ceramic floorings a constant updating becomes necessary. The advance of new technologies in this sector has motivated the appearance of new ceramic materials and designs, which offer new innovative opportunities

In this sense, the ceramic sector is devoting a great economical effort in imitating natural stones. To improve the competitiveness of these proposals, ceramic manufacturers need to know to what extent their imitations look alike real stones. This fact will help designers to find out if differences in messages conveyance appear, making out the way to reach more realism if necessary.

At present, ceramic companies know the opinion of the designers, architects and the rest of professionals involved in the decision-making process. However, more often than not they do not ask directly consumers' demands. This way stakeholders act as a bridge between the company and the consumer. This fact could be a serious drawback as significant differences in product form perception may appear between stakeholders and consumers [2].

All this together make even more important to know emotional consumers' response and preferences about the product for ceramic companies. Herein the term "emotional response" refers to the user's global perception consisting of its cognitive answer (and related secondary emotions [3]) and its hedonic response. In particular, cognitive answer makes reference to the response driven by both the perception of tangible stimuli and pre-existing knowledge. According to previous studies [4][5][6], cognitive answer can be summarized by three categories: aesthetic impression, semantic interpretation and symbolic association [7].

Using Semantic Differential [8], a product semantic study has been made to deal directly with consumers and to know consumers' perception about the appearance of the ceramic floorings. Product Semantics has been successfully used for evaluating products as well as for

the analysis of semantic structures. Many applications are found in literature for the design of footwear [9] [10], public transit interiors [11], mobile phones [12] and so on.

Specifically, this study analyzes similarities and differences in consumers' perception elicited by natural stones and their ceramics imitations. In addition, a preference model depending on user's perception has been drawn. The work developed is described further on in the paper.

2. MATERIAL AND METHODS

The emotional concepts obtained in the framework of a previous industrial project were used for present study (Semantics PCCP, 2001). The project was focused on exploring the emotional response elicited by floorings used for home environments using Semantic Differential method. This method involved collecting from several sources (final users, experts and business channels) a large number of descriptors of the perception regarding the product. 54 terms resulted from grouping and filtering these descriptors. 40 consumers used these terms to evaluate a sample of 34 ceramic tiles. The method used to extract the emotional concepts was Principal component analysis [9]. The resulting list of 13 emotional concepts is showed in Table 1.

Table 1: Emotional concepts used in present study

INNOVATIVE
RESISTANT
COMFORTABLE
ELEGANT
PRACTICAL
HIGH QUALITY
HANDCRAFTED
SPACIOUSNESS
HYGIENIC
COLORFUL
COMPLEX
SOBER
DELICATE

A sample of different natural stones and ceramic flooring was gathered for comparing the emotional response of consumers regarding these different materials. The sample used in the study was formed by 17 models representative of the different materials currently used in the market: six natural stones, including slate, marble and granite and 11 ceramic pieces simulating these materials.

Consumers were able to see and touch real pieces of materials. Each product of the sample included a piece of the material and a picture of a virtual representation of a home environment using the same material as depicted in Figure 1.



Figure 1: Left: Natural granite; right: ceramics imitating marble

Consumers had to evaluate the sample of products using the 13 emotional concepts. They sat in front the reference for its visual and tactile evaluation, see Figure 2.



Figure 2: Evaluation session

10 women and 10 men aged between 30 and 55 took part in the experiment. They were paid by the experimental session. They filled in a questionnaire including as many questions as emotional concepts. Question wording was "*This flooring is...*". Five-point semantic differential scales (strongly agree; agree; neither agree/disagree; disagree; strongly disagree) formed by the emotional axis and its negative were used to answer the questions. The questionnaire also included a question about the intention of selecting the product for home. The wording was "Would you put this flooring at your home?" with positive or negative answer.

The questionnaire was applied to all models of the sample in order to obtain the emotional perception. The emotional concepts were randomly ordered in each questionnaire to avoid

bias during the evaluation process. The order of the products for the evaluation was also randomized for each respondent.

Logistic regression was applied to model the influence of the perceived image on the selection of the product for home. This type of model is suitable for predicting categorical variables [13] [14]. The intention of selecting the product for home was used as dependent variable and the 13 emotional concepts were used as independent factors.

Analysis of variance ($p < 0.05$) was applied to each semantic concept to study the influence of the family on the perception associated to the product. For each axis, type of flooring was considered a fixed factor and subjects as random factor.

3. RESULTS

The logistic regression model provided the emotional concepts significantly influencing the preference for this type of flooring and the level of importance of these concepts. There are three emotional concepts influencing the intention of selecting the product for home: comfortable, elegant and sober (Table 2). Most relevant concept is comfortable, with the highest coefficient odds ($\exp \beta$), closely followed by *elegant*. *Sober* is the less relevant concept influencing the selection of the product. The Nagelkerke R square value obtained was 0,528.

Table 2: Results obtained from the logistic regression model

	B	S.E.	Wald	df	Sig.	Exp(B)
INNOVATIVE	-0,010	0,157	0,004	1	0,951	0,990
RESISTANT	-0,100	0,250	0,158	1	0,691	0,905
COMFORTABLE	0,961	0,181	28,103	1	0,000	2,614
ELEGANT	0,828	0,196	17,803	1	0,000	2,289
PRACTICAL	0,343	0,206	2,768	1	0,096	1,410
HIGH QUALITY	0,260	0,260	0,996	1	0,318	1,297
HANDCRAFTED	0,114	0,129	0,772	1	0,380	1,120
SPACIOUSNESS	0,198	0,162	1,496	1	0,221	1,219
HYGIENIC	0,154	0,208	0,545	1	0,460	1,166
COLORFUL	0,187	0,147	1,615	1	0,204	1,206
COMPLEX	-0,031	0,184	0,028	1	0,867	0,970
SOBER	0,499	0,136	13,397	1	0,000	1,647
DELICATE	0,018	0,170	0,012	1	0,913	1,019
Constant	-1,106	0,313	12,483	1	0,000	0,331

The analyses of variance provided significant differences between ceramics and natural stones in seven emotional concepts. They were: *innovative*, *resistant*, *comfortable*, *elegant*, *handcrafted*, *spaciousness* and *colorful* (see Table 3).

Table 3: Influence of the type of flooring on the different semantic concepts.

SEMANTIC CONCEPT	P-Value
INNOVATIVE	0,000
RESISTANT	0,021
COMFORTABLE	0,003
ELEGANT	0,003
PRACTICAL	0,649
HIGH QUALITY	0,134
HANDCRAFTED	0,000
SPACIOUSNESS	0,000
HYGIENIC	0,204
COLORFUL	0,005
COMPLEX	0,054
SOBER	0,208
DELICATE	0,966

Figure 3 shows the mean values plot including the 95% confidence intervals of the seven emotional concepts.

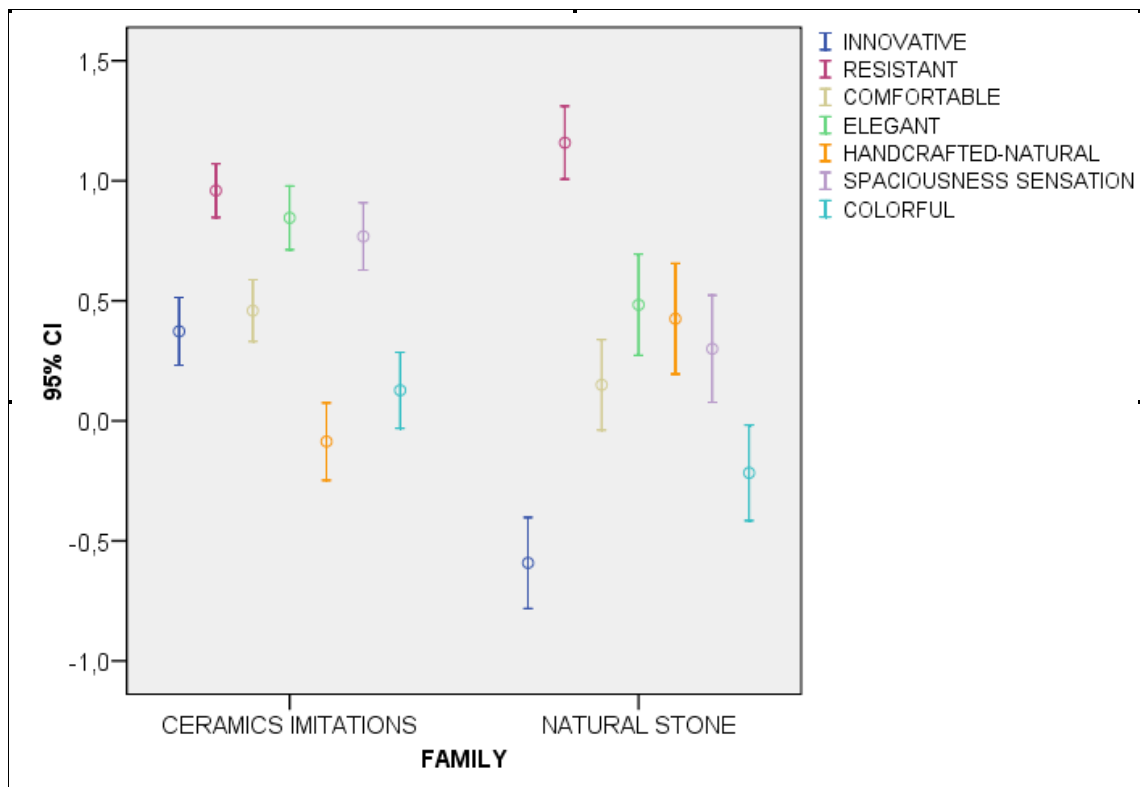


Figure 3: Mean scores of the emotional concepts for each type of flooring

4. DISCUSSION

The application of Product Semantics has allowed the evaluation of the similarities and differences between natural stones and ceramics imitations. Furthermore, the study has allowed designers to gain an insight into consumers' preferences and perceptions derived from real product- user interactions.

It is worthy to say that consumer response to product evaluation follows a process that comprises cognition, affect and behavior [15] [16]. Norman describes cognition and affect as different information processing systems that influences each other, with cognition leading affect and affect influencing cognition [17]. Although making a division between cognition and affect is convenient to analyze the perceptual process, considerable interdependence exists [7]. However, if the cognitive response of consumers to products precedes the emotional response [18] or vice-versa [19] is still an open discussion [20]. Present study, in line with Lazarus' work, considers that emotional responses in terms of basic emotions arise after a cognitive assessment. Thus, the affective response elaborated in terms of basic emotions [21] needs a specific study beyond the scope of present study.

It is worth saying that in this study visual and tactile interactions were allowed during the evaluation process. Regarding the mode of representation, previous works have stated that perceptual response provoked by different representation types could be different from that generated by the real product [22] [23]. To avoid any influence of the mode of graphical representation real pieces of the materials have been used in this study. Indeed, apart from this real piece, a virtual representation simulating an environment with the material in a home context has been used. The aim was to gather consumers' preferences and perceptions simulating real consumer-product interaction during shopping experiences. This fact contributes to enrich stimuli transmission and product messages interpretation [24].

Regarding the preference model, only three out of thirteen emotional concepts (comfortable, elegant and sober) had significant influence on the consumers' preference. Thus the design efforts should be focused on emphasizing the image associated to these concepts. It can be thought that concepts like Hygienic, resistant, high-quality and practical do not have any influence because users consider them as basic quality attributes, taking them for granted. The value of the Nagelkerke R square involves a good predictive efficacy of the model. The verbal expression of the perception can explain more than 50% of the variance in the selection of the product derived from the visual and tactile interaction.

Significant differences between ceramics and natural stones were found in seven out of thirteen emotional concepts. In most of these concepts ceramics imitations obtain higher mean values than natural stones. Comfortable and elegant are two of these concepts. This is relevant because they have significant influence on the preference model obtained. Only in two concepts ceramics imitations obtain lower mean values than natural stones: resistant and handcrafted. This result provides guidelines for designers to reach an image closer to natural stones. It is worth saying that no significant differences have been found in hygienic concept, which is used as a claim by ceramics manufacturers.

Companies tend to establish target consumers' profile by means of common demographic variables, psychological aspects and motivational values. However no specific target profile

has been used in present study. Thus results are too general so further studies are required to consider specific profiles.

Results provided by present study have twofold industrial relevance:

- They allow overcoming the gap between companies and users, identifying innovation opportunities.
- Detection of weaknesses and strong points of ceramics regarding natural stones, one of its competitors, in emotional terms.

These results are valuable information to focus product development and communication strategies of ceramic companies.

5. CONCLUSION

Product semantics has been proven as a useful technique to explore the emotional consumers' response to ceramic floorings imitating natural stones. It can be concluded that ceramic imitations differs from natural stones perceptions in some emotional concepts. Ceramic tiles improve the results of natural stones in the most relevant concepts related to consumers' preference.

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