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# ON PRODUCTS SHAPES AND PERSONALITIES

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## ABSTRACT

In this paper, preliminary results of the first stage of a long-term research that aims at systematizing the task of product design with an intended personality are reported. A survey was conducted to detect whether there is a correlation between product shapes and personalities. In the survey people were asked to associate personalities to shapes of different types of products. The data collected from the survey were analyzed using multivariate statistical techniques and the results obtained from correlation analysis between shapes and personalities are presented. At this stage, among the different aspects of the product appearance, the focus of the survey was on the shape of the product, as it is one of its most relevant features. The aim of this stage is to detect whether a high correlation exists between product shapes and product personalities. At the next stage if such correlation exists, the numerical description of the shape will be analyzed to identify common geometrical features of products sharing the same personality. This information can later be used as input for developing a new CAD system to assist designers to develop new products with embedded personalities.

*Keywords: conceptual design, product personality, shape design*

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# 1 INTRODUCTION

Commonly, consumer purchase decisions are triggered not only by technical and functional aspects of a product but also by the emotional response of the consumer to the product aesthetic appearance (Chen, 2009). In fact the appearance of a product is extremely relevant for its commercial success (Bruce, 1988). Among the features defining the aesthetic appearance of a product, the shape is one of the most important (Hsiao, 2006). Therefore it is possible inferring that the emotional response produced by a given product in a consumer is partially influenced by certain features of the product form. Usually, consumers refer to products using adjectives or personalities commonly associated to humans. For example, by saying "this is a cute mug" or "this is an aggressive car". This way of referring to products leads to what has been called the "product personality" (Govers, 2003 and Mugge, 2009). As described in Govers (2004), the "product personality" can be defined by a set of characteristics that people use to describe and discriminate products from others. Examples of 23 product personalities can be found in Ortiz (2011). It has been demonstrated that the product personality perceived by consumers has direct relation with some visual product aesthetic features like simplicity, harmony, balance, unity, dynamics, novelty and timeliness/fashion (Brunel, 2007), all features well understood by industrial designers as well as artists.

In order to develop products that better fit consumers personal needs, Chen (2009) has successfully identified and numerically described key geometric features related to the product personality of different types of knives. The research was focused on establishing precise definitions of the product shape and on studying the statistic correlation between shape features and consumers response. The reported results show the viability of the method in linking geometric features to product personalities. However, this research was focused on a specific product, without extending the research to a range of different products to find out whether a universal relationship between product personality and geometric features exist. In a related approach, the influence of aesthetic features on brand recognition was investigated by Ranscombe (2012). The study was carried out using saloon cars. By discomposing different car images into their constituent aesthetic shape features, customers were surveyed to find out whether they could recognize the car brand based just on the partial information given to them. As result, it was possible to identify the aesthetic key features that influenced customer brand recognition. Finally, in Ortiz (2011) evidence was provided regarding the feasibility of designing products with a given personality. In the study, industrial design students were asked to design products with a given product personality, considering general appearance attributes such as shape, material, colour, finish, textures, size and composition. Then, a group of 54 people was asked to assign a personality to each product. For some personalities (e.g. elegant and provocative) there was a good match between the intended product personality and the personality detected by the "consumers", leading to the conclusion that "designers can influence meaning in product appearance". Although the conclusion of this study is very promising in advancing the knowledge on the border between the areas of consumer perception of products and product design, it does not show a way to systematize the task of designing of products with a specific personality. By considering several product appearance attributes at once, such systematization is difficult to do as many variables are at playing on triggering the consumer response to the product (like shape, material or finish). Finally, the Kansei engineering method has studied the links between products and consumer emotions (Huang, 2012). However, the process of selecting the principal geometric features associated to a specific Kansei tag (a concept like classic or gentle) still lies in the special ability of the industrial designer to detect the design features that triggers the desired consumer reaction to the final product.

In this paper, we report the results of the first stage of a long-term research that aims at systematizing the task of product design with an intended personality. This first stage, among the different aspects of the product appearance, it is focused on the shape of the product, as it is one of its most relevant features. The objective of the first stage is 1) detecting whether a high correlation exists between product shapes and product personalities and 2) if such correlation exists, the numerical description of the shape will be analyzed to identify common geometrical features of products sharing the same personality.

This work is related to other two pieces of ongoing research. First, to a research focused on the characterization of two dimensional daily products images to detect different clusters based on geometric features. The second is focused on the development of a structured method for imprinting aesthetic concepts that trigger a specific customer emotional response. The first is based on the idea that any geometric shape can be numerically characterized and then, shapes with similar numerical characterizations can be clustered together, meanwhile the second is based on the analysis of the common process carried out by industrial designers for developing new products appearance. It is expected that the conjunction of these three pieces of work can provide the fundamental knowledge for developing new CAD supporting tools for designers to help them to develop creative new products shapes with specific aesthetical concepts by applying “geometric modifiers” associated to the concepts.

The remaining of this paper reports preliminary results on the research carried out to detect whether there is a correlation between product shapes and personalities. To do so, we first conducted a survey where people were asked to associate a personality to the shape of different types of products. The preparation of this survey and its structure are reported in Section 1 of this paper. Next, the data collected from the survey was analyzed using multivariate statistical techniques, as explained in Section 2. Results obtained from correlation analysis between shapes and personalities are presented in Section 3 along with a discussion about our findings. Finally, Section 4 concludes this paper.

# 2 PRODUCT SHAPE AND PERSONALITY SURVEY

The preparation of the survey was made of four stages. In the first stage, key product concepts were selected and defined during focus group activities. In the second stage, the same method was used for selecting the shapes most suitable for the purpose of this research. In the third stage a questionnaire was structured with questions about the shapes and concepts previously defined. In the last stage, a survey was conducted to collect the data. The work carried out in each stage is described in the following.

## 2.1 Selection of Concepts

We decided that the questionnaire should not include more than ten concepts, both for reducing problems of similarity between concepts and for keeping the focus of the interviewees during the survey.

Due to the inherent subjectivity of the concept selection task, we carried out the selection by means of a focus group activity. The focus group was made of 4 university researchers working in the area of product design. After several stages of refinement, the group obtained a unanimous selection. The selected concepts were: *friendly*, *gentle*, *elegant*, *aggressive*, *sporty*, *generou*s, *funny*, *happy and calm.* It was decided that the questionnaires should include a free answer as well.

## 2.2 Selection of Shapes

The criterion to select the shapes was that they corresponded to products of daily use. Thus, several black and white silhouettes of 4 types of daily products were chosen. Even if product personality depends on a mix of variables as the product shape and silhouette, color, texture or geometrical ratios, to maintain separated these multiple variables the focus in this paper is on product silhouettes only.

The chosen products were mugs, lamps, chairs and magnifying glasses. The first three are easily recognizable by its silhouette while the last one is not. The reason for such distinction is important in order to analyze whether the association of the shape to the product personality is biased or not by the understanding of the type the object belongs to.

A set of one-bit images for each product were used (figure 1). The use of one-bit images allows focusing in the shape of the product rather than other aesthetic features. It was assumed that, by having a shape with different characteristics, each image of the same product might lead to a different concepts association. Thus, the focus group aimed at selecting one different one-bit image per concept for each type of product.

## 2.3 Questionnaire elaboration

The aim of the questionnaire was to find out the interviewees mind associations between the shapes and the concepts selected. Thus, it was structured including some personal details of the interviewee (gender, age, occupation and nationality), shapes and concepts. The main page presents the interviewee with 10 shapes portrayed in their black and white image. Aside each shape the ten concepts are listed. Forty shapes were spread into four different questionnaires to allow parallel surveys. Mind association is encouraged by asking the interviewee to answer the questionnaire in as a short time as possible. That is the reason why more than 10 shapes per questionnaire would not be convenient. Figure 1 shows the four groups of shapes included in each questionnaire.

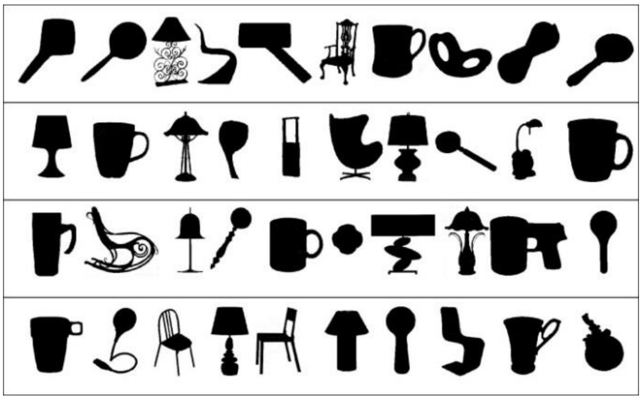

*Figure 1. Groups of shapes included in the questionnaires*

## 2.4 Survey: place, people, characteristics

The survey took place in the main touristic spot of Pisa, Italy, during the spring 2012. The questionnaire was presented as an ongoing research of the University of Pisa. Because of the touristic attraction spot, the survey was applied in Italian and English language. Three researchers asked people to fill the questionnaire by choosing no more than three concepts for each image. Each participant was asked for a quick answer for encouraging spontaneous mind associations. Sixty four people from Australia, Belarus, Canada, China, France, Germany, India, Italy, Mexico, Portugal, Singapore, Spain, UK and USA completed the questionnaire. The interviewees were between 15 and 70 years old (mean age: 29,77) and were 52% females, 48% males.

# 3 DATA ANALYSIS

The results of the survey were collected and structured in a 40x10 matrix. Rows describe the 40 silhouettes of products and columns present the 10 concepts.

For each questionnaire the number of times the i-th shape and the j-th concept have been linked by the interviewees has been collected. The element (i, j) of the final matrix contains the ratio between such a value and the total number of interviewees who participated to that particular questionnaire. The 40x10 matrix was the input data for the statistical analysis. Data were analyzed by means of correlation analysis and principal component analysis (PCA). These are multivariate statistical techniques used to identify existing correlations links between variables. Starting from complex matrix of data, such techniques are able to extract information about the existing links between variables. This promotes the analysis of similarities between variables hence the identification of groups of related variables. The correlation matrix is composed of coefficients of correlation (in a scale from 0 to 1) and immediately indicates information about links between couples of variables. Such matrix shows couples of variables which are independent (lower values of correlation) and pairs of variables with some degree of dependency (higher values of correlation). If applicable, PCA permits correlations analysis between a set of variables, not just in pairs as the correlation analysis. It reduces the n-dimensional starting information in two or three dimensional information guaranteeing minimum information loss.

Both techniques are not able to demonstrate cause-effect relations but are effective in quantifying links between variables.

Concepts are analyzed both by means of correlation and PCA while shapes are analyzed only with the correlation matrix because matrix dimensions exceed the limits for a PCA application. On one hand multivariate statistical analysis over concepts helps in understanding which adjectives are considered similar hence could be eliminated in further surveys. On the other hand such analysis on objects allows understating shapes perceived analogously hence creating some clusters of shapes depending on their scores.

Both kind of analysis have been carried out with R (version 2.15.0), an open source statistical software. Once matrix data are inserted, simple queries permit obtaining the correlation matrix and PCA analysis and a graphical representation.

# 4 RESULTS

By means of multivariate statistical analysis the paper seeks discovering dependencies between variables of the matrix. In order to study dependencies both between shapes and between concepts correlation analysis has been carried out twice. Changing the perspective of the analysis allows discovering both correlations between silhouettes (i.e. which shapes are perceived similarly) and between product personalities (i.e. which concepts are considered similarly hence can be grouped into a just one higher level variable).

## 4.1 Shapes results

The correlation values of the different pairs of shapes were stored in a 40x40 diagonal and symmetrical correlation matrix. The element (m,n) of this matrix represents the correlation value between the shape of the m-th row and the shape of the n-th column. Correlation analysis has been adopted instead of PCA since the high number of shape pairs.
Considering the squared matrix, for each row coefficients of correlation have been sorted in a crescent way. Carrying on a row by row analysis, it is possible to understand which couple of shapes presents the highest positive correlation and then, to group similar scored shapes in clusters. Additionally, it is possible to split the analysis in two parts considering positive and negative correlation respectively.

### 4.1.1 Positive Correlation between shapes

Four groups of shapes have shown extraordinary high positive correlations. In order to seek explaining the complexity of correlations bond a sub-cluster has been added. The matrix of correlation is listed below. Cluster one is composed of the following shapes and characterized by the following coefficients of correlation:

*Table 1. Cluster One*

| | **A1** | **A5** | **B5** | **C9** | **B8** |
|---|---|---|---|---|---|
| **A1** | 1 | .96 | .93 | .79 | .73 |
| **A5** | .96 | 1 | .91 | .83 | .82 |
| **B5** | .93 | .91 | 1 | .73 | .74 |
| **C9** | .79 | .83 | .73 | 1 | .73 |
| **B8** | .73 | .82 | .74 | .73 | 1 |

*Table 1 - Cluster Two*

| | **A3** | **D4** | **C2** | **B7** | **D9** | **A6** | **B1** | **D5** | **C8** | **B6** | **B3** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **A3** | 1 | .96 | .95 | .95 | .94 | .94 | .89 | .89 | .87 | .84 | .77 |
| **D4** | .96 | 1 | .95 | .95 | .94 | .97 | .89 | .86 | .85 | .83 | .71 |
| **C2** | .95 | .95 | 1 | .93 | .84 | .90 | .95 | .83 | .78 | .83 | .68 |
| **B7** | .95 | .95 | .93 | 1 | .93 | .88 | .83 | .88 | .76 | .79 | .81 |
| **D9** | .94 | .94 | .84 | .93 | 1 | .91 | .77 | .86 | .81 | .76 | .76 |
| **A6** | .94 | .97 | .90 | .88 | .91 | 1 | .88 | .83 | .93 | .83 | .71 |
| **B1** | .89 | .89 | .95 | .83 | .77 | .88 | 1 | .78 | .84 | .89 | .57 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **D5** | .89 | .86 | .83 | .88 | .86 | .83 | .78 | 1 | .76 | .80 | .87 |
| **C8** | .87 | .85 | .78 | .76 | .81 | .93 | .84 | .76 | 1 | .87 | .63 |
| **B6** | .84 | .83 | .83 | .79 | .76 | .83 | .89 | .80 | .87 | 1 | .51 |
| **B3** | .77 | .71 | .68 | .81 | .76 | .71 | .57 | .87 | .63 | .51 | 1 |

*Table 2 - Cluster Three*

| | **A7** | **D1** | **B10** | **B2** | **D3** | **C5** | **A9** |
|---|---|---|---|---|---|---|---|
| **A7** | 1 | .94 | .88 | .81 | .71 | .70 | .67 |
| **D1** | .94 | 1 | .91 | .90 | .83 | .84 | .85 |
| **B10** | .88 | .91 | 1 | .90 | .78 | .61 | .75 |
| **B2** | .81 | .90 | .90 | 1 | .94 | .77 | .85 |
| **D3** | .71 | .83 | .78 | .94 | 1 | .80 | .92 |
| **C5** | .70 | .84 | .61 | .77 | .80 | 1 | .80 |
| **A9** | .67 | .85 | .75 | .85 | .92 | .80 | 1 |

Even though it is lower comparing with those of previous clustering, a couple of shapes have a relevant correlation, they represents our fourth cluster:

*Table 3 - Cluster Four*

| | **A8** | **D8** |
|---|---|---|
| **A8** | 1 | .80 |
| **D8** | .80 | 1 |

Moreover some sub-clusters have been defined considering shapes that already belong to one of clusters listed before. For example, C9 belongs to the first cluster but at the same time has interesting correlations with the following shapes.

*Table 4 - First sub-cluster*

| | **C9** | **C4** | **D10** | **D2** |
|---|---|---|---|---|
| **C9** | 1 | .91 | .79 | .50 |
| **C4** | .91 | 1 | .84 | .64 |
| **D10** | .79 | .84 | 1 | .72 |
| **D2** | .50 | .64 | .72 | 1 |

### 4.1.2 Negative Correlation between shapes

While positive coefficients of correlation are extremely high, negative correlations are weaker. The maximum negative correlation is -0,65. Starting from clusters previously defined negative correlations are picked out. Even results are not as impressive as positive correlations, they are interesting and worth presenting. Negative correlations are summarized with the table 6 which sorts them in ascending order.

## 4.2 Concepts results

Table 7 describes correlations between each couple of concepts, hence the degree of dependency between two variables. Table 8 collects PCA loadings. Intending components of the PCA as axis of a

new vector space, loadings are the expression of the coordinates of each variable (concept) into the new reference vector space. They express how the concepts carry meaning to each component: higher is the value of the loading more that variable contributes to interpret the meaning of the component.
It is clear that even results of correlation analysis and PCA may be similar the interpretation is completely different. Coefficients of correlation show just the link between two variables. Going further with such analysis, the correlation matrix sometimes evidence groups of variables, hence clusters highly correlated. Loadings analysis follow a different approach: it already groups variables into a new system of coordinates. Each component embeds the meaning of the variables that have highest values.

*Table 6. Negative correlations*

| SHAPE A | COEFFICIENT OF NEGATIVE CORRELATION | SHAPE B | SHAPE A | COEFFICIENT OF NEGATIVE CORRELATION | SHAPE B |
|---|---|---|---|---|---|
| **A7** | -0.65 | **D2** | **B8** | -0.59 | **C5** |
| **C7** | -0.64 | **D3** | **D1** | -0.59 | **D2** |
| **B6** | -0.63 | **D10** | **C10** | -0.58 | **D9** |
| **C7** | -0.62 | **C5** | **A5** | -0.57 | **C5** |
| **A4** | -0.61 | **C6** | **B1** | -0.57 | **D10** |
| **C2** | -0.60 | **D10** | **D4** | -0.57 | **D10** |
| **A9** | -0.59 | **C7** | **D7** | -0.57 | **C10** |
| **A10** | -0.59 | **B9** | | | |

**4.2.1 Correlation analysis**

The correlation values of the different pairs of concepts are shown on the 10x10 diagonal and symmetrical correlation matrix shown in Table 7. The element (q, r) of this matrix represents the correlation value between the concept of the q-th row and the concept of the r-th column. The results allow identifying clusters of concepts intended or understood as similar by the participants of the survey (those with high positive values of correlation).
From the data of Table 7, some concept clusters can be identified. First, the higher correlation values can be observed for the triplet of concepts *Friendly*, *Calm* and *Generous* (correlation values equal to 0.47, 0.65 and 0.47, respectively). A second cluster is composed of the concept pair *Funny* and *Happy* (0.44). A third cluster is made of the concepts *Sporty* and *Aggressive* (0.41) whilst a weaker fourth cluster composed of *Gentle* and *Elegant* (0.29) was also detected. Note that the concept *Elegant* has only one positive correlation, something that does not occur with the rest of the concepts studied. These results show that the concepts belonging to the same cluster are perceived as similar by the surveyed people.
It is also worth to notice some high negative correlations between some concept pairs: *Aggressive* and *Gentle* (-0.47), *Aggressive* and *Elegant* (-0.39, which shows coherence with the positive correlation between *Elegant* and *Gentle*) and *Elegant* and *Sporty* (-0.38). These results hint that these concepts are understood as opposites by the interviewees.

**4.2.2 Principal Component Analysis**

Though coefficients are not high, they suggest some interesting consideration. In order to get deeper the analysis and obtain results in a graphical solution, PCA has been carried out. The assumption is that by means of PCA we are reducing the starting set of information. But keeping the higher variance of starting data set results are able to explain the major part of information. In this case results of PCA confirm that four dimensions are able to explain more than 84% of the starting data set variance. It means that is a good result. It is particularly good since the four dimensions are the four clusters of concepts extracted from the correlation (matrixes (from Table1 to table 5). Results of PCA confirm suppositions made during the study of concepts correlations. The following table shows how concepts are split into components. Previous considerations suggest focusing on the first three or four components.

*Table 7. Correlation matrix.*

| | Friendly | Gentle | Elegant | Aggressive | Sporty | Generous | Funny | Happy | Calm | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| Friendly | 1 | 0.19 | -0.22 | -0.34 | -0.26 | **0.47** | -0.35 | -0.12 | **0.65** | -0.25 |
| Gentle | 0.19 | 1 | **0.29** | -0.47 | -0.07 | -0.12 | -0.29 | -0.30 | 0.23 | -0.19 |
| Elegant | -0.22 | **0.29** | 1 | -0.39 | -0.38 | -0.21 | -0.14 | -0.18 | -0.06 | -0.30 |
| Aggressive | -0.34 | -0.47 | -0.39 | 1 | **0.41** | -0.21 | 0.09 | -0.04 | -0.46 | 0.02 |
| Sporty | -0.26 | -0.07 | -0.38 | **0.41** | 1 | -0.39 | 0.12 | 0.09 | -0.46 | 0.00 |
| Generous | **0.47** | -0.12 | -0.21 | -0.21 | -0.39 | 1 | -0.20 | -0.21 | 0.43 | 0.21 |
| Funny | -0.35 | -0.29 | -0.14 | 0.09 | 0.12 | -0.20 | 1 | **0.44** | -0.45 | 0.07 |
| Happy | -0.12 | -0.30 | -0.18 | -0.04 | 0.09 | -0.21 | **0.44** | 1 | -0.27 | 0.18 |
| Calm | 0.65 | 0.23 | -0.06 | -0.46 | -0.46 | 0.43 | -0.45 | -0.27 | 1 | -0.22 |
| Other | -0.25 | -0.19 | -0.30 | 0.02 | 0.00 | 0.21 | 0.07 | 0.18 | -0.22 | 1 |

*Table 8. PCA Loadings*

| | **Comp1** | **Comp2** | **Comp3** | **Comp4** | **Comp5** | **Comp6** | **Comp7** | **Comp8** | **Comp9** | **Comp10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Friendly** | -0.189 | -0.495 | | | 0.728 | -0.311 | 0.170 | | -0.150 | -0.199 |
| **Gentle** | -0.200 | | | 0.498 | | 0.445 | 0.452 | -0.440 | 0.323 | |
| **Elegant** | -0.610 | 0.643 | -0.192 | -0.131 | 0.250 | | -0.104 | 0.124 | 0.138 | -0.220 |
| **Aggressive** | 0.543 | 0.106 | -0.561 | -0.382 | 0.281 | 0.196 | | -0.178 | 0.206 | -0.202 |
| **Sporty** | 0.297 | | -0.108 | 0.676 | 0.175 | | -0.314 | 0.468 | 0.213 | -0.204 |
| **Generous** | | -0.194 | | -0.245 | -0.150 | -0.181 | 0.410 | 0.454 | 0.680 | |
| **Funny** | 0.238 | 0.234 | 0.735 | -0.195 | 0.323 | 0.390 | | 0.149 | | -0.162 |
| **Happy** | | | 0.294 | | | -0.454 | -0.384 | -0.553 | 0.492 | |
| **Calm** | -0.315 | -0.482 | | -0.183 | -0.109 | 0.482 | -0.535 | | 0.189 | -0.253 |
| **Other** | | | | | -0.393 | -0.188 | 0.228 | | -0.156 | -0.851 |

Empty spaces are loadings with the decimal unit null, hence they can be approximated to zero. Since first three components explain the 77% of the whole cumulative variance the analysis focuses on the first three columns.

Loadings express the load that each variable has within a component. Their value ranges from -1 to 1. Moreover, can be interpreted in a three dimensional space. In particular it is possible to see that:

- First component describes the distance between on one hand Aggressive and Sporty and on the other hand Elegant, Calm, Gentle and Friendly. It is the description of C1 and C2+C3
- Second component distinguish Elegant from Friendly and Calm. It is the decomposition of C2+C3 into C2 and C3.
- Third component is the description of the distance between on one hand Funny and Happy and on the other hand Aggressive. This is the characterization of C4

## 4.3 Combined Results

Even if the numerical results of correlations are clear, results can also be summarized in a Cartesian plane. Such representation combines both shape and concept results and it gives a visual representation of the correlation. The weak point is represented by the 2D representation. Actually three dimensional data (the 3 principal components defined above), may be misunderstood because of the lack of the third dimension representation.

However the reader can benefit from the 2D representation since it shows the existence of the results previously described. In particular the following four clusters can be observed:

- Friendly, calm, generous
- Gentle, elegant
- Aggressive, sporty
- Funny, happy.

Such diagram permits the association of each cluster of shapes to each cluster of concept that is our dimension.
It is interesting noticing that shapes of C1 are scattered along the first component in the positive direction. Hence it follows the Aggressive dimension. Shapes of C2 follows the elegant dimension and the shapes which belongs to cluster 3 are grouped around the concepts of Friendly and Calm.

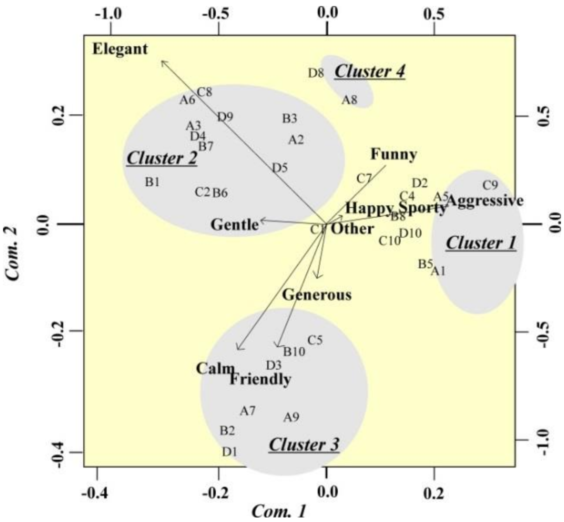


*Figure 1. PCA*

## 5 DISCUSSION

Concepts clustering, suggests that concepts within the same group are possibly interpreted similarly. It confirms interesting suppositions as Elegant is linked to Gentle, while Friendly and Calm form another group (plus Generous). Finally Funny and Happy are strongly correlated.
At the same time Elegant is opposed to Aggressive and Sporty and to Calm and Friendly as well. Hence, for future surveys, the number of concepts might be reduced keeping just the most representative ones.
Shapes clustering are interesting as well. It is possible to notice that clusters are described by objects which belong to the same or similar product class. Indeed clustering follows a class product criteria rather than a shape similarity one. The shape clustering result evidences the inability of people in expressing a clear judgment of a shape without the comprehension of the object. Such way of reasoning may lead to consider that: humans while are judging an object firstly express an opinion on the object category and later on the object silhouette.
Understanding the class to which the objects belong, participants are judging not only aesthetical features but social issues as well.
Joining the shapes and the concepts results it results clear that:

- first cluster of product is associate to the Aggressive and Sporty concept;
- second cluster shapes describe the concept of Elegant and Gentle;
- The shapes which belong to the third cluster are connected with Friendly and Calm concepts.

The correct understanding of the class to which the product belongs, seems to be relevant for the success of the survey. Fuzzier correlations are obtained by those objects which shape is not clear. While objects which shape more understandable received more aligned and higher scores. Moreover scores are higher for those objects whose shape triggers an association with products, even though the association is not the correct one. For example magnifying glasses in the first sub-cluster (C4, C2) is probably confused with some blunt instruments.
The purpose of such shapes had the aim of creating ambiguity and confusion in the interviewees. Actually, some shapes are chosen because they can be confused with other objects and to understand if the perception of product personality is concept driven or shape driven.
It is possible to suppose that shapes scores describe a similarity in products' function (even social functions) rather than a judgment on aesthetical features. Converting pictures into black and white images we thought people would have focused only on the shape. Conversely, results show that more usual shapes get higher correlations while less common and understandable shapes get lower scores.

## 6 CONCLUSIONS

The test evidences that most answers had been given after people recognized the product. It highlights the inability of a structured opinion in absence of a class reference. Each interviewee has the tendency to connect the shape to an object that belongs to his-her personal background. Hence he/she is not associating the personality to the shape portrayed in the questionnaire but the associated object personality was with past objects and which are evoked by the shape. It emerges clearly from the unambiguous judgment for more recognizable products and the consequent inability in being able to give an answer statistically interesting for objects whose shape is harder to be recognized.
Future works are oriented to extend the survey also to other counties to understand if and how the association between concept and shape vary with the cultural background of the participants.

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