



EXPERIMENTAL EVALUATION OF “PRODUCT EMOTION” COMPUTER PROGRAMME

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Abstract: This paper presents the process and the results of an experimental evaluation of the computer programme “Product Emotion” - designed by Pieter Desmet. “Product Emotion” is aimed to assess the design of a product on the basis of generated emotions. Also, the programme’s interface uses only graphical elements in order to avoid words and numbers. 69 subjects tried the programme, assessing the design of two products. Their results were statistically analysed. Their opinions were recorded and analysed. Conclusions were drawn regarding the usefulness, ease of use and precision of the programme.

Key words: product emotion, design evaluation, intuitive assessment.

1. INTRODUCTION

Industrial design has an increasing role in the competitive market of our days. Bob Hayes, professor emeritus at the Harvard Business School, said: “Fifteen years ago, companies competed on price. Today it’s quality. Tomorrow it’s design.” [1]

Researchers discovered that products with a strong emotional component are successful in terms of sale and premium price. People are predisposed to buy products that make them happy. Many books and papers were written on the subject. Donald A. Norman wrote in his seminal textbook *Emotional Design – Why We Love (or Hate) Everyday Things*: “Humans are predisposed to anthropomorphise, to project human emotions and beliefs into anything. On the one hand, the anthropomorphic responses can bring great delight and pleasure to the user of the product. If everything works smoothly, fulfilling expectations, the affective system responds positively, bringing pleasure to the user. Similarly, if the design itself is elegant, beautiful, or perhaps playful and fun, once again the affective system reacts positively. In both cases, we attribute our pleasure to the product, so we praise it, and in extreme cases become emotionally attached to it” [2].

The designers acknowledged this situation and have started to design products that trigger intense emotions in the spirit of users and contemplators. The process of design conception has 3 phases, as clearly indicates Carole Bouchard [3]:

1. Information [and Research];
2. Generation;
3. Evaluation and decision.

In the third phase, potential users are asked to evaluate different design concepts proposed by designers. Decisions are subsequently taken based on the potential users’ preferences and observations. In order to take the best decision, the users’ input should be relevant, consistent and easy to process.

Usually, the marketing approach offers consistent information and the data can be easily processed using

statistical tools. The problem is the relevance issue. A marketing survey involves numbers and numbers activate the left hemisphere of the brain.

But the design evaluation should be a right hemisphere process. Betty Edwards emphasised that the right hemisphere of the brain is synthetic, concrete, analogical, intuitive, holistic and, above all, artistic [4]. Also, the left hemisphere is inclined to take control and to override the right hemisphere. In order to prevent this, the use of numbers and words and the reading of time should be avoided.

Based on the above considerations, Pieter Desmet conceived an evaluation methodology for emotional aspects of design. His methodology used only graphic elements. The methodology was materialised into a computer programme called “Product Emotion” or “PrEmo”. The methodology and the computer programme were part of his PhD thesis [5].

2. THE “PRODUCT EMOTION” PROGRAMME

Pieter Desmet assumed that fundamental are 14 emotions: 7 positive emotions and 7 negative emotions. These emotions are indicated in Table 1.

When seeing a product, a contemplator will experience only a part of the 14 emotions. Also, the emotional experience will take place on different levels. Because of this, Desmet introduced a scale of emotion intensity.

Table 1

The 14 Emotions

Positive Emotions	Negative Emotions
Inspiration	Disgust
Desire	Indignation
Pleasant surprise	Contempt
Fascination	Boredom
Amusement	Unpleasant surprise
Admiration	Dissatisfaction
Satisfaction	Disappointment



Fig. 1. Emotion Cartoon and Intensity Scale (on left).

The scale of emotion intensity has 3 levels:

- 1 - contemplator does not experience the emotion;
- 2 - contemplator experiences partially the emotion;
- 3 - contemplator experiences strongly the emotion.

In order to avoid the use of numbers and an excessive use of words, Desmet decided to use only graphic elements in the process of evaluation. So, each emotion was personified by a specific cartoon, as the one presented in Fig. 1. The levels of emotion intensity were coded by colours:

- 1 - teal;
- 2 - beige;
- 3 - yellow.

The computer programme allows the introduction of the picture of the assessed product. It saves the results of assessment into a coma-separated-value (*.csv) file. This file can be converted into a spreadsheet or a database. The data can be statistically processed.

3. DESIGN OF EXPERIMENT

The author of the present paper designed an experiment with the following aims:

- evaluation of the programme’s usefulness;
- evaluation of the programme’s ease of use;
- evaluation of the programme’s precision.

It was decided that the programme will be used by a certain number of subjects. Two products (coffee makers) were selected as samples in this experiment. These products are displayed in Figs. 2 and 3.



Fig. 2. Product 1 (Mundane Coffee Maker).



Fig. 3. Product 2 (Striking Coffee Maker).

Also, it was set that the recorded results comprising the assessment values will be statistically analysed. The relevant statistical indicators were decided to be: the mean, the standard deviation and the variance. The Cronbach’s alpha indicator will be employed to measure the precision of the programme as an assessment instrument.

It was settled that the subjects will test the programme in small groups. After the completion of testing phase, short workshops will be organised. The subjects will be encouraged to discuss freely about their experience using the programme.

4. RESULTS OF EXPERIMENT

The experiment was run with 69 subjects. All the subjects were students at a technical faculty. All the experiment’s sessions were supervised by the author of the present paper.

The experiment’s results were gathered in a spreadsheet and statistical calculations were performed. The statistical indicators for products 1 and 2 are presented in Tables 2 and 3.

Table 2

Statistical Indicators for Product 1

Emotion	Mean	Standard Deviation	Variance
Inspiration	2.10	0.75	0.56
Desire	1.73	0.76	0.58
Pleasant surprise	1.77	0.78	0.61
Fascination	1.77	0.75	0.56
Amusement	1.46	0.65	0.42
Admiration	1.69	0.83	0.69
Satisfaction	2.15	0.80	0.64
Disgust	1.25	0.56	0.32
Indignation	1.44	0.65	0.42
Contempt	1.58	0.68	0.46
Boredom	1.88	0.79	0.62
Unpleasant surprise	1.31	0.62	0.39
Dissatisfaction	1.67	0.75	0.57
Disappointment	1.75	0.67	0.45

Table 3

Statistical Indicators for Product 2

Emotion	Mean	Standard Deviation	Variance
Inspiration	2.23	0.69	0.48
Desire	1.98	0.79	0.62
Pleasant surprise	1.98	0.73	0.53
Fascination	2.40	0.68	0.46
Amusement	1.79	0.80	0.64
Admiration	2.06	0.76	0.57
Satisfaction	2.31	0.80	0.64
Disgust	1.31	0.62	0.39
Indignation	1.60	0.79	0.63
Contempt	1.50	0.71	0.51
Boredom	1.63	0.70	0.49
Unpleasant surprise	1.44	0.62	0.38
Dissatisfaction	1.54	0.71	0.51
Disappointment	1.69	0.69	0.47

From Table 2, it results that emotions with means above value 2 are “Satisfaction” (2.15) and “Inspiration” (2.10). The lowest mean is 1.25 for “Disgust”. After the comparison of these means to the picture of product 1, it can be supposed that the programme’s statistical indications are correct: The product offers satisfaction and inspiration, and it is not disgusting at all. It must be emphasised that only two means of positive emotions are above value 2.

From Table 3, it results that emotions with means above value 2 are “Fascination” (2.40), “Satisfaction” (2.31), “Inspiration” (2.23) and “Admiration” (2.06). The lowest mean is 1.31 for “Disgust”. After the comparison of these means to the picture of product 2, it can be concluded that the programme’s indications are correct: The product is fascinating, it offers satisfaction and inspiration and it can be subject to admiration. Product 2 has four means above value 2, which is very significant.

The values of standard deviation ranges from 0.56 to 0.83 for both products. Considering that the variation interval for emotion intensity is 2 units (from 1 to 3), the values of standard deviation are too high, which indicates a certain imprecision of results.

Table 4

Overall Means

Product	Type of Emotion	Mean
1	Positive	1.81
	Negative	1.51
2	Positive	2.11
	Negative	1.53

An overall view over the significances of the means displayed in Tables 2 and 3 is presented in Table 4.

It is obvious that product 1 has the means of the positive emotions and negative emotions more closely together than product 2. Also, product 2 has the mean of positive emotions above the value 2. In a certain degree, this was expected. Product 1 is very common, even dull. Product 2 has an interesting look, inducing stronger positive emotions.

Figure 4 displays the histogram of emotions against their means for product 1. The emotions were descendently ordered. The rectangles coloured in black point-out the emotions that are misplaced. “Boredom” and “Disappointment”, negative emotions, should be on the right side of the chart, not on the left side. Also, “Amusement”, a positive emotion, should be on the left side of the chart. This indicates that the design of product 1 should be improved in terms of amusement and the boredom and disappointment aspects should be eliminated.

In case of product 2 (Table 3), the highest mean of a negative emotion is lower than the lowest mean of positive emotion. So, there are no misplaced emotions and this indicates that is no need for special improvement actions.

Figure 5 displays the comparative histogram between means of product 1 and product 2. It represents the case of selection of the optimum design concept from a series of concepts. The winning concept should score higher at the positive emotions and lower at the negative emotions. It can be observed in Figure 5 that product 2 scored higher at all positive emotions and lower at 4 negative emotions. The problems are at “Disgust”, “Indignation” and “Unpleasant Surprise”. These are the aspects that should be reworked at product 2 using product 1 as inspiration.

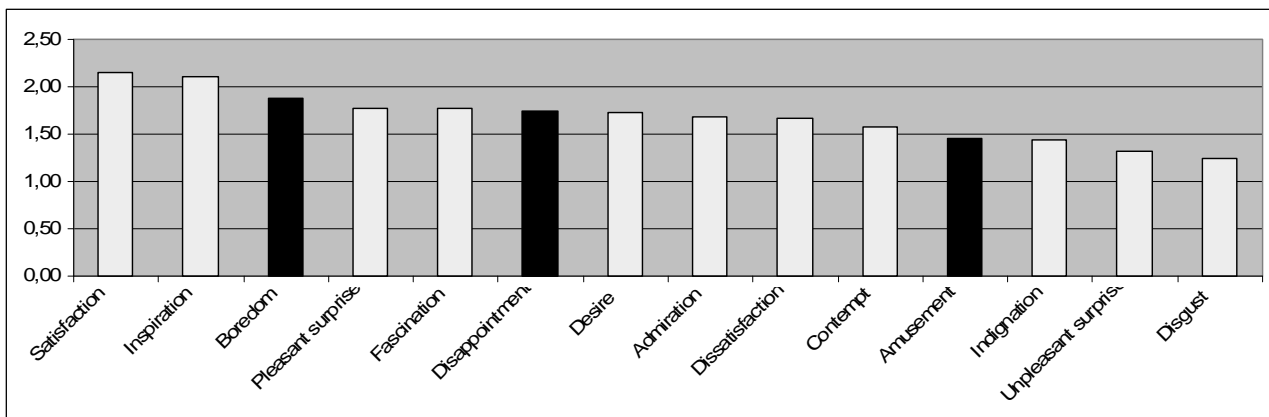


Fig. 4. Emotion Mean Chart for Product 1.

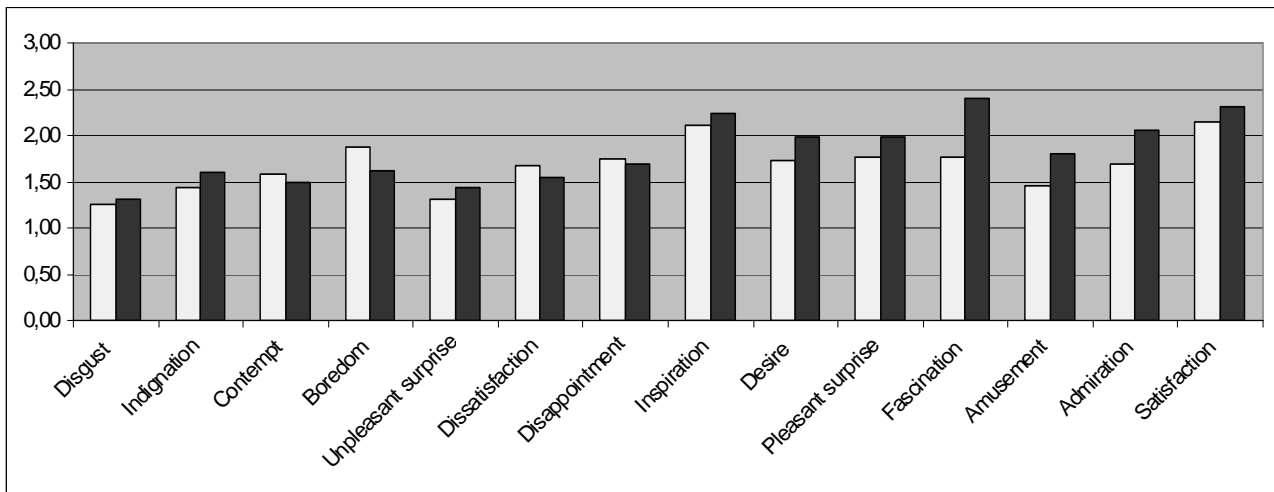


Fig. 5. Comparative Chart of Means (Product 1 – displayed in light colour; Product 2 – displayed in dark colour).

The precision of the programme as an assessment instrument was measured using the Cronbach's alpha indicator. The Cronbach's alpha is the classic indicator used in psychometric assessment and this programme records psychic responses. Its formula is [6]:

$$\alpha = \frac{N}{N-1} \left(\frac{\sigma_x^2 - \sum \sigma_{y_i}^2}{\sigma_x^2} \right), \quad (1)$$

where N is the number of items (emotions); σ_x^2 - the variance of the observed total test scores, and $\sigma_{y_i}^2$ is the variance of item i .

The Cronbach's alpha for the two products are:

$$\alpha_1 = 0.54;$$

$$\alpha_2 = 0.59.$$

If the programme is a precise instrument, the Cronbach's alpha should be higher than the critical value of **0.70**. But the programme scored less.

The workshops carried-out after the programme testing revealed the following aspects:

- Almost all subjects agreed that the programme is easy to use.
- Almost all subjects agreed that the programme is enjoyable.
- Some subjects did not feel comfortable without knowing the name of emotions.
- Some subjects perceived the programme as not a precise and reliable tool, but just a toy.
- Some subjects considered that 14 emotions are too many and the results are biased by this.

5. CONCLUSIONS

The "Product Emotion" programme was evaluated using two approaches:

- experimental testing performed by subjects;
- workshops with subjects.

Based on the results presented above, the conclusions of experimental testing and workshops with subjects are the following:

The "Production Emotion" programme is a useful tool in the assessment of the emotional aspects of product's design. Its results point-out the positive

emotion's features that should be improved. Also, the programme's results indicate the negative emotion's feature that should be diminished.

The programme's results allow the comparison for selection between a series of design concepts. The comparison also permits the identification of selected concept's features that should be improved.

The programme is easy and enjoyable to use. The enjoyable features made some subjects to mistrust the results against criteria like reliability and precision.

Some subjects were not comfortable without knowing the names of the analysed emotions, but actually this is a positive aspect. The judgements are made only by the artistic brain, respectively the right hemisphere.

The precision of the programme as an assessment instrument, measured with Cronbach's alpha indicator, was discovered to be lower than the standard.

The final conclusion is that the programme is useful and easy to use and it enables the right hemisphere to perform the evaluation of emotional aspects of design.

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