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Product novelty impact on user Kansei

Marcos Mendoza Vázquez [1], Toshimasa Yamanaka 2[2]

[1] *University of Tsukuba-Graduate School of Comprehensive Human Sciences, Japan, menvaz@gmail.com*
[2] *University of Tsukuba-Graduate School of Comprehensive Human Sciences, Japan, tyam@geijutsu.tsukuba.ac.jp*

Abstract: This paper presents an experimental study that assesses the impact of novelty appraisal on user´s emotional feelings and in their evaluation of user experience with commercial products. After actual interaction with 4 products differing in two levels of design typicality of design in two categories of products (cameras and highlighters) participants used a SD method for the evaluation of user experience quality, and a two-dimensional mood scale survey for assessing their own emotional feeling. Likewise, participants were asked if they had seen and if they had used the products before, obtaining three cases: 1. who had already used it before (no novelty), 2. who had seen it but not used it (relative novelty) and 3. who had not seen it before (absolute novelty). The previous experience of participants with the particular product defined the degree of novelty appraisal, confirming that typical products were more likely to be appraised as known and atypical ones as novel.

Results on emotional feeling measures showed slightly higher pleasure levels for the not novel cases and significantly higher arousal for the relative novelty cases. For the quality of experience evaluation, the highest scores for the no novelty cases were “practical”, “useful”, “predictable” and “easy to understand”; the relative novelty cases were “interesting”, “creative”, “satisfying” and “like”; and the absolute novelty cases were for “interesting”, “creative”, “new” and “innovative”. These findings suggest that visual stimulation prior the first use interaction has an arousal enhancing effect in the experience of use, accompanied by qualities related to novelty.

Keywords: Novelty, Typicality, User Experience, Emotion.

1. INTRODUCTION

Also supported by the framework of product emotions of Desmet (2007), the appraisal theory perspective proposes that emotion is a result of the judgment of the significance of a product depending ones' concerns. When a stimulus characteristic is perceived as fulfilling some personal concern, it will cause an emotion (positive or negative). Novelty is defined as one of the evaluation checks (Scherer, 1984), as well as intrinsic pleasantness, goal compliance, coping potential and norm-compatibility, each one can be related to a respective basic concern of the person: attitudes, goals, standards and knowledge. Novelty is determined by the previous knowledge of users, upon which expectations regarding a product are built.

In this context, an experimental research aimed at explore the interactions between the novelty of a product, the cognitive constructs in terms of perceived qualities of the user experience, and the emotional feeling derived from the experience, could mean a contribution for the understanding of the mechanism of emotion appraisals. Also, represent an opportunity to reflect on the role of novelty in user experience, Is novelty a positive value by itself? How does it interact with other external factors and properties of the product?

1.1. Appraisals

Appraisal theory claims in its essence that emotions are elicited by evaluations (appraisals) of events and situations (Roseman, 1984). Since the same situation might be able to elicit different emotional reactions in different individuals, and one person may react differently to the same situation in different point in time, it results very helpful to consider emotional reaction as elicited by a distinctive pattern of appraisal. In this perspective is considered that the emotion is not caused by the situation itself, but by the interpretation of it. The situations, persons, environments objects that we met in our daily experiences are evaluated by the emotional process, according to which we develop behaviors

1.2. Typicality

Typicality can be defined as the degree to which an object represents a category. This characteristic can be determined by three factors (Barsalou, 1985) similarity to one ideal of the category, similarity to a central tendency of the category, and frequency of encounters as member of the category.

Hekkert and colleagues´ (2003) experimental research proved the relationship between typicality and novelty regarding aesthetic preference of products, finding that both factors are equally important in explaining the aesthetical preference; as more typical a stimulus, the less perceived as novel and as more novel, the less typical. It was also found that typicality and novelty were not perfectly opposed, so it is possible to obtain a balance of the two for eliciting aesthetic preference.

There are somehow divergent postures regarding the aesthetic evaluations of typical stimuli. For some, an effect of preference for the typicality has been found and proven using a wide variation of types of stimuli, such as paintings (Hekkert & van Wieringen, 1990), furniture (Whitfield & Slatter, 1979), music (Smith & Melara, 1990) human faces (Langlois & Roggman, 1990) and advertising images (Sanabria, 2012). These theories are also compatible with Zajonc´s (1968) research on mere exposure effect, that state that unreinforced repeated exposure to stimulus increases their positive affect. This effect has been explained arguing that the familiar is preferred over the novel because it implies to avoid the risk of the unknown inherent to novel stimuli.

2. EXPERIMENTAL STUDY

2.1 Objective

The present experimental study had the objective of assessing the impact of product novelty in users´ inner emotional feeling states and subjective impressions based on actual interaction.

2.1. Experiement outline

A total of 32 Japanese students (16 female, 16 male) of graduate and undergraduate levels from the University of Tsukuba participated voluntarily.

2.1.1 Hypotheses

1. Products appraised as novel will elicit higher arousal and pleasure levels than products appraised as not novel.

2. Products appraised as novel will be evaluated with higher scores in user experience qualities than products appraised as not novel.

Figure 1: Framework of the study

2.2. Measures

The use experience quality with the product was measured using a Semantic Differential (SD) method, consisting of 18 pairs of antonym words in a 7 level scale (see Table 1). The scale corresponded to: 0="neither one", which was situated in the middle; and 1="slightly", 2="moderately", 3="highly" for each side corresponding to each word. The words selected for this evaluation included both instrumental and non-instrumental qualities of the interaction experience. The words were selected after considering previous research on user experience evaluation (Hassenzahl 2005, 2007, Karapanos, 2008; Jordan, 2000; Hekkert, 2006) to compose an original array of words. The printed version used for the experiment presented the words in random arrange of the right and left columns and it was written only in Japanese.

The emotional feeling response of the participants was measured using the "Two dimensional Mood Scale for Self-monitoring and Self-regulation of Momentary Mood States" (TDMS) (Sakairi, 2013). This method consists on evaluating on a chart the own momentary mood by giving a score in a 6 level Likert scale to 8 different mood words. The words used are: Energetic, Lively, Lethargic, Listless, Relaxed, Calm, Irritated and Nervous. The scale gave scores from "Not at all"=0 to "Extremely"=5. The scores given for the different words are used to calculate a measurement of the Vitality, Stability, Pleasure and Arousal indexes (see Table 2).

Table 1: Words used for use experience quality measure (SD)

Necessary	Unnecesary
Cheap	Expensive
Creative	Not creative
Innovative	Not innovative
Interesting	Not interesting
Simple	Complex
New	Common
Human-like	Machine-like
Practical	Unpractical
Unpredictable	Predictable
Easy to understand	Difficult to understand
Easy to use	Difficult to use
Useful	Useless
Reliable	Unreliable
Satisfying	Not satisfying
Beautiful	Not Beautiful
Like	Dislike
Good	Bad

Table 2: Measures and score calculation of TDMS

Measurement index	**Word rating calculation**
VITALITY	(Energetic+Lively)-(Lethargic+Listless)
STABILITY	(Calm+Relaxed)-(Irritated +Nervous)
PLEASURE	PLEASURE+STABILITY
AROUSAL	VITALITY-STABILITY

2.3. Procedure

1. Feeling self-assessment (before interaction)

Participants rated their own emotional feeling using the TDMS to obtain a baseline measure before the product interaction. Participants filled the TDMS on the original paper survey, evaluating their own feeling according to the 8 words (Energetic, Lively, Lethargic, Listless, Relaxed, Calm, Irritated and Nervous) in a 6-level Likert scale (0 to 5).

2. Product interaction

According to the counterbalanced order, the researcher took the corresponding product from a bag away from participant sight and placed it on the table in front of the participant. Then, participants were instructed to take it and use it freely as long time as they wanted. Participants are instructed to tell when they are finished the interaction.

In this stage the time of interaction was measured from the moment the user was given the product to the moment in which the participant notified finishing the interaction.

3. Feeling self-assessment (after interaction)
After the interaction stage, the emotional feeling was again measured using the TDMS, in the same way they had before the interaction.

4. Experience evaluation
The experience quality evaluation is obtained using the SD method. Participants rated the 18 pairs of words according to the 7 level Likert scale on a printed piece of paper in order to evaluate their experience with the product.

5. Previous knowledge evaluation
Participants responded YES or NO to the next two questions in a written questionnaire: (A)“Have you seen this product or a very similar before?” and (B) “Have you used this product or a very similar one before?”.

Fig 2: Experiment procedure

2.4. Stimuli

The distinction in levels of design typicality considered the perceptual and functional characteristics of the samples in the degree to which they corresponded to a central tendency in their category. Accordingly, the typical design displays common characteristics and family resemblance corresponding to the central tendency, while the atypical design sample is characterized as different to the central tendency. An important remark here is that both typical and atypical designs had to remain perceived as members of the same category of products, therefore the atypical sample should not be as radically different from the central tendency than it could be perceived out of the category.

The parts of the product were a focal point to distinguish the central tendency and consequently their typicality. The parts of the product represent perceptual features related intrinsically to their function and user behavior (Tversky, 1984). On each category, a range of 30 commercial products available was analyzed and compared to define one central tendency. (See Annex 1) The shape of the basic parts forming the structure of the products was sorted and the most frequently found shapes were identified to define a central tendency. Samples corresponding absolutely to these characteristics were considered as typical. Samples that did not displayed the basic part in the prototypical shape, were found radically different from the central tendency, and therefore were discarded as they might be perceived outside the category. As a result, the samples chosen as atypical shared the basic characters for being considered in the category of products but had different features as way of use, functionality and shape, the atypical camera takes 360° panorama pictures by spinning around, while the atypical highlighter has a tip that allows drawing 3 different kinds of lines.

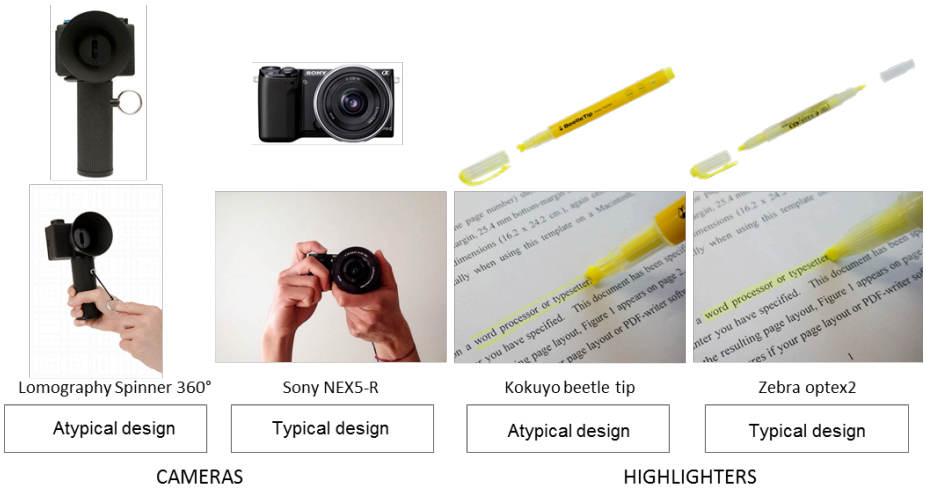

Fig.3: Samples selected as stimuli

2.5 Results

The influence of previous experience factor was calculated on a one-way ANOVA of the emotional feeling scores after interaction in four categories. The only one that showed a significant difference was the arousal ($F(2,125) = 3.07$, $p = 0.049$). A post hoc Tukey HSD test showed that the only significant difference was between the “seen but not used” group and the “used before” group.

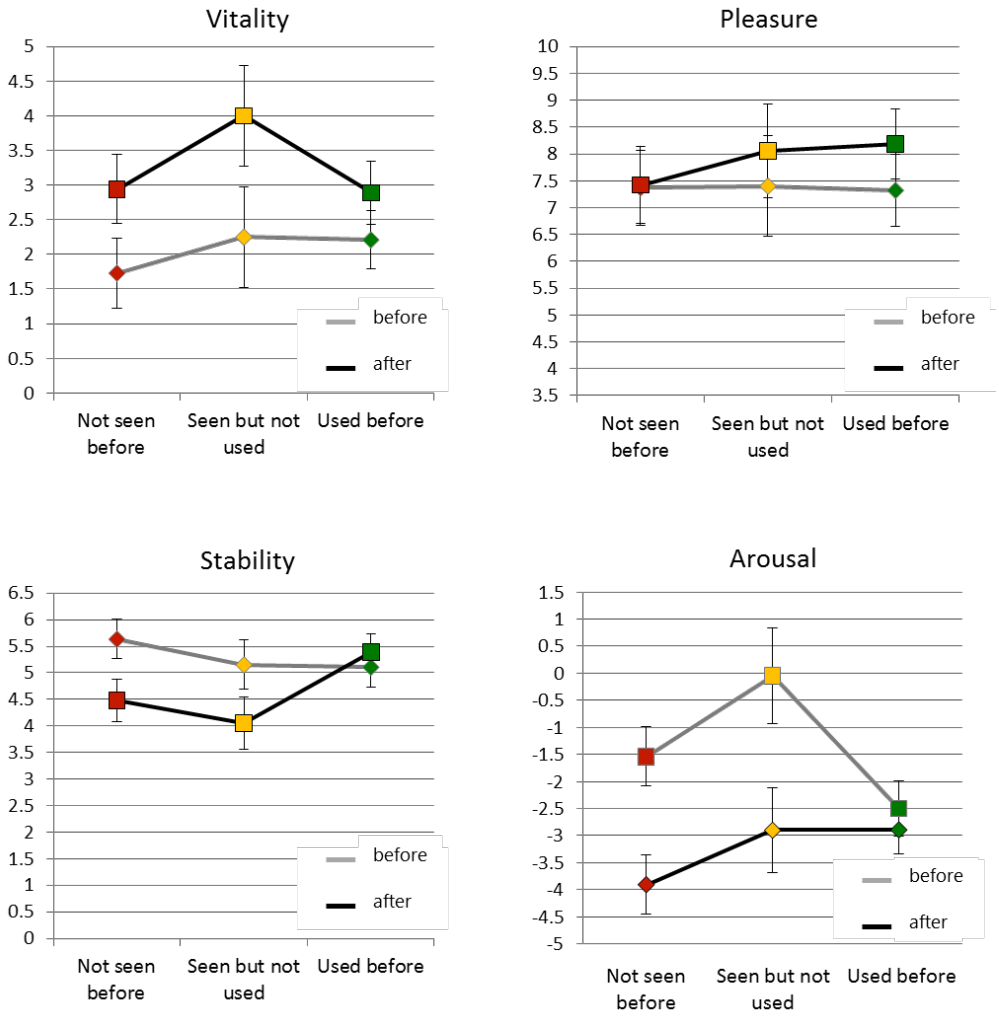

Fig 4: Emotional feeling scores according to the previous experience factor

2.5.1 Typicality and previous experience

The emotional feeling evaluations performed before and after the interaction with the 4 products by the 32 participants, resulted in a total of 256 evaluations. From this total, the half corresponded to the ratings of the typical products and the other half to the atypical ones. Participants were asked if they had seen and if they had used the product (or an extremely similar one) in the past; therefore, resulting feasible cases were labeled according to three levels: “not seen before”, “seen but not used before” and “used before”. Table 1 shows the count of cases and its proportion in each group.

Table 2: Distribution of correspondence of “typicality” with “previous experience” levels

FACTOR	LEVELS	N	PREVIOUS EXPERIENCE LEVELS		
			Not seen before c (%)	Seen but not used before c (%)	Used before c (%)
Typicality	Atypical	128	102 (79.68)	18 (14.06)	8 (6.26)
	Typical	128	2 (1.56)	22 (17.19)	104 (81.25)
	TOTAL	256	104 (40.62)	40 (15.62)	112 (43.76)

2.5.2 Experiment factors influence on interaction time

The time variable was related to the experiment condition factors using one-way ANOVA. The typicality factor did not show any significant difference ($F(1, 126) = 0.939$, $p = 0.33$). The factor of types of products showed a significant difference ($F(1,126) = 25.03$, $p < 0.001$) so that cameras ($m = 113.84$s, $SD = 62.445$) registered longer periods of time during interaction than highlighters ($m = 68.20$s, $SD = 37.762$). The previous experience with the product factor also showed a significant influence on the times of interaction ($F(2,125) = 4.918$, $p = 0.0087$), so that the “seen but not used” cases registered the longest times ($m = 116$s, $SD = 8.022$), followed by the “not seen before” ($m = 98.44$s, $SD = 43.956$) and the “used before” ($m = 75.21$s, $SD = 48.692$) in the third place. After a Tukey HSD post-hoc test, the only significant difference found was between the “seen but not used” and the “used before” ($MD = 40$, 95%CI (7.04/74.53), $p = 0.013$).

2.5.3 Analysis of user experience evaluation ratings.

The pairs of words (18 items) used to evaluate the experience quality in the semantic differential method were reduced using a principal component analysis based on the scores obtained after the evaluation of the 4 samples of products by the 32 participants. As a result, three components displayed eigenvalues greater than 1 and were used to perform varimax rotation. These three components accounted for the 73.32% of the total variance. The items were allocated to a component if they showed a loading greater than 0.65. Accordingly, the first component had 9 items and was labelled as “instrumental satisfaction”; the second component had 4 items and was labeled as “novelty quality”; the third component had 3 items and was labeled as “approachability”.

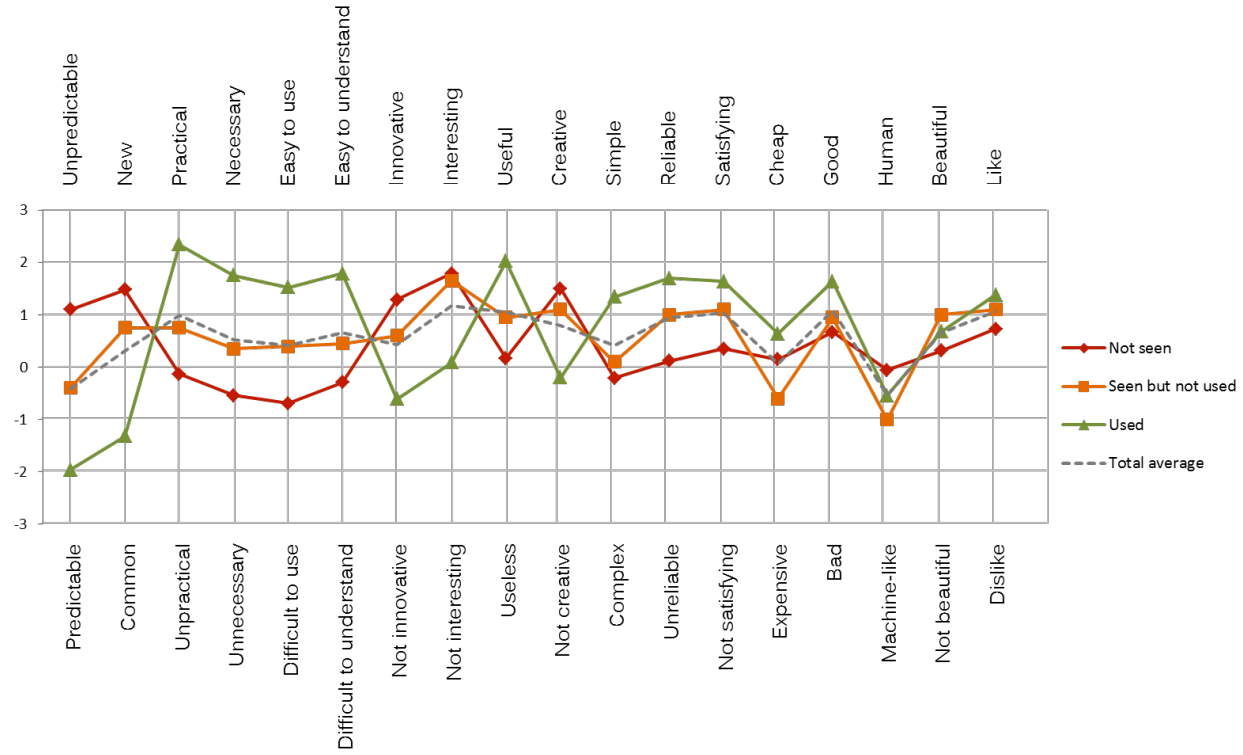

Fig 5: Emotional feeling scores according to the previous experience factor

The scores of SD method by the factor of "previous experience" were analyzed through ANOVA, and a Post hoc test to know the significant differences among its three levels. After assessing the statistical significance of the three combinations among levels, words were grouped according to the number of significant differences (from three to none).

Table 3: Summary of SD evaluation and emotional response among three levels of previous experience

(0) Not seen before	(1) Seen but not used before	(2) Used before
Unpredictable		Predictable
Difficult to use		Easy to use
		Practical
New		Common
Innovative		Not innovative
Interesting		
Creative		
	Expensive*	
		Necesary
		Useful
		Easy to understand
	Reliable	
	Satisfying	
		Simple
		Good

* Only 0.1 above the neutral level

3 DISCUSSION

An experimental approach based on interaction with real products was applied for evaluating the effect of product novelty on emotional feelings and evaluation of qualities of user experience. The measurement of these two parameters, linked to the particular level of previous experience of the user with the product allowed to explain the effects of the novelty appraisal. The two hypotheses are confronted to the results of the experiment as follows:

1. Products appraised as novel will elicit higher arousal and pleasure levels than products appraised as not novel. This hypothesis was supported for the arousal, but not for the pleasure.

The analysis of the emotional feeling scores among the levels of previous experience showed a statistically significant difference only for the arousal measurement. This difference was found between the “seen but not used”, which obtained the highest score among the three cases, and the “used before”, which obtained the lowest. This result supports the theories that novelty is accompanied by an autonomic arousal caused by the conflict of adaptation to the new stimulus (Berlyne, 1960). Regarding pleasure, contrary to the proposed hypothesis, the highest mean score was obtained by the case of “used before” followed by “seen but not used” and “not seen before”. Effect of mere exposure or an improvement of process fluency can be the reason for this increased pleasure response towards the familiar product.

2. Products appraised as novel will be evaluated with higher scores in user experience qualities than products appraised as not novel. The results do not support this hypothesis completely.

The analysis of the evaluation of qualities of user experience among the levels of previous experience of the participants did not show a tendency of general high scores vs. low scores; the results of each case had their own set of particular attributes (Table 3). In other words, rather than be divided in bad or good, they displayed different characteristics. Upon these differences, it was possible to get a better picture of the whole phenomenon of novelty. Instrumental qualities like “easy to use”, “practical”, “useful” and “easy to understand” were found as characteristic for the case participants had used the product in the past. Qualities like “new”, “innovative”, “interesting” and “creative” were shared between the participants who had not used the product before (“not seen before” and “seen but not used”). Besides, in the case participants had not seen the product before, they distinguished the experience as “difficult to use” and “unpredictable”. Additionally, the evaluation of the qualities of “reliability” and “satisfaction” of the participants who had seen the product before but used it for the first time in the experiment (“seen but not used”), were as high as those who had used the product before.

4 CONCLUSION

This study analyzed product novelty as an appraisal dependent of the participant´s previous experience, and used typicality (resemblance to a central tendency) as a factor for triggering it.

The nature of the three cases of previous experience regarding the product can be explained through the interplay of two elements: change and expectation. Novelty implies a change in regard to the previous experience, something new that has not encountered before. Expectation consists of the mental representation of what is likely to happen, which is predominantly derived from previous experience. Regarding these elements, the case in which participants had previous experience of use (“used before”) with the product, there is no change, because the stimulus is not

new, and experience is found to be congruent with the expectation about it. For the other two described cases, “not seen before” and “seen but not used” the product was used for the first time, implying a change in regard of the previous experience for both, however the element of expectation marks a substantial difference: in the case participants had not seen the product before, they face an unexpected situation, while participants that had at least the antecedent of having seen the product, they knew what to expect of it.

1. Not seen before: unexpected change situation
2. Seen but not used: expected change situation
3. Used before: expected situation without change

This fact can explain the main two results obtained of emotional feeling evaluations. The “seen but not used” cases were distinguished for having the highest arousal and highest vitality levels: the impact of the novel stimulus was supported by the expectation built over the previous visual experience. The other result was that of the “used before” cases, which were characterized for had increased in stability, while the other two decreased. The “used before” cases corresponded mostly to the interaction with typical designs, so its feeling response seems to support the effect of repetitive exposure reflected in increased familiarity, and expressed in a preference for typicality.

The distinctively positive impact found in the case participants experienced the use of products for the first time supported by previous visual exposure (“seen but not used”) seems to go along with the idea that the novelty appraisal has better effects when perceived in a relative level. The other two cases described in the study can be interpreted as absolute (or extremely close to absolute) levels of novelty and not novelty; for those cases of “not seen (and not used) before”, novelty is exceedingly high and for those of “used before” cases is null. The positive impact of the stimulus is related to the relevance derived from degree of familiarity, as Berlyne states it “we are indifferent to things that are either too remote from our experience or too familiar.”

In the field of design, these insights can be interpreted in the sense that a novel product, not just for being novel, will be relevant. The priority would be to cover user needs for achieving satisfaction, and as a result from a creative process conceive a novel product. If the core of the novel product is just its newness, it would likely achieve a quick peak of preference and will turn the tide vanishing in the same way. As mentioned by Loewy, there has to be a point in which the product design gets its “most advanced, yet acceptable (MAYA)” point, to be successful, that is, a relative degree of change, supported by the expectations of target users. In this sense, when proposing new ideas is important to know well which are the expectations and mental schemas, perceptions and ideals of users.

One more field of interest in this research is communication and advertising. A complex mixture of elements come to play, but novelty, repetition and the changing psychological effects that has on the perceiver are fundamental to convey an effective, appealing and engaging message. The mechanism of advertising itself uses stimuli in massive exposure and repetition to which consumers feel familiarity and preference for some time. It may occur that the stimulus becomes indifferent and start reducing its positive value. It seems a good strategy to maintain essential elements in the stimulus for keeping the recognition and pleasurable response, but along time add changes, new arranges and new elements that keeps it update and with arousal potential.

The present experiment was based on the evaluation of the interaction with products occurring one single time, but a new perspective of research could include subsequent interactions to understand its changes over time. In this experiment the context of use was reduced to laboratory conditions, but there is the opportunity for future research to include the context as a relevant factor. The closer to actual conditions of the phenomena, the more reliable, complete and helpful it would be.

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6. ANNEXES

Annex 1: Sample screening for highlighter markers

1  Crown line maker	2  Zebra Highlighter Sparky 1	3  Bic Brite liner	4  Pilot Spotliter	5  Propus highlighter cartidge
6  Zebra optex 2	7  Pilot spotlitter 2	8  Zebra optex care	9  Tombow coat	10  Stabilo navigator
11  Tokai Osto	12  Muji knock system highlighter	13  Zebra knock highlighter	14  Pentel Handy line S	15  Sharpie Accent Retractable Highlighter
16  Sharpie mini accent	17  Sharpie Smear Guard Blade	18  Stabilo Boss	19  Pilot frixion soft color	20  Mitsubishi pro mark view
21  Propus window soft color twin type	22  Staedler textsurfer gel	23  Kokuyo Beetle tip	24  Flag Highlighter With Memo Sticker	25  Parallelogram Shape Highlighter Marker
26  Triangle Highlighter	27  Capsule highlighter marker	28  Highlighter Fluorescent Marker Graffiti Pen School Office	29  Needle syringe shape highlighter injection pen	30  5-In-One-Hand-Highlighter

Annex 2: Sample screening for cameras

1  Sony Cybershot DSC RX100	2  Canon Powershot s120	3  Nikon 1 J2	4  Leika 18489	5 
6  Sigma DP2	7  Casio EX-ZR800BK	8  Sony NEX-5R	9  Samsung NX1000	10 
11  Canon EOS M	12  Pentax k-01	13  Fujifilm X-A1	14  Olympus PEN E-P5	15 
16  Panasonic LUMIX DMC-FZ70-K	17  Pentax K-5II 18-135WR	18  Nikon D3100	19  Lomography Holga	20  Lomography La Sardina
21  Lomography spinner 360	22  Sony Cyber-shot DSC-TX30	23  Clap 380	24  Fujifilm FinePix XP200	25  Canon Powershot D20
26  Lomography oktomat	27  Lomography Blackbird fly	28  Casio Exilim EX-TR15	29  Ricoh Theta	30  Panono