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Managing Innovation in Highly Restrictive Environments

Lessons from Latin America and Emerging Markets

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Contents

A Series of Recommendations for Industrial Design Conceptualizing Based on Emotional Design

David Cortés Sáenz, Carlos Eduardo Díaz Domínguez, Pere Llorach-Massana, Ainoa Abella García and Juan Luis Hernández Arellano

Abstract Emotional design, since its birth in the 70s, has developed into becoming one of the main forces that drive design nowadays. The capability of understanding the user's feelings and emotions is considered to be a pivotal part of the design process. More than ever before, industrial designers need to consider the emotional side of consumers to create meaningful and successful products. The present study created a series of recommendations for Industrial Design Conceptualizing based on Emotional Design. These were developed through the analysis of several design emotion-based methodologies, conceptualization theories, and emotional design itself. The recommendations were developed to be applied in the conceptualization phase, for it is at this stage of the design process when the designer gives shape to the initial concept that will ultimately become a product. After its completion, to validate the recommendations, these were handed to a group of eight industrial design students who applied them on one of their academic projects. The results of their works were subjected to analysis to determine the impact on their projects. Students were also asked their opinion about emotional design and the recommendations they were given. Principal results evidence that only the 15% of the students knew about emotional design before being introduced by the present research. Five out of eight of the resulting projects managed to incorporate values and concepts related to emotional design. It reflects that the resulting ultimate products can be influenced by the capabilities of designers to use the recommendations. It could be concluded that the recommendations could be of great interest for industrial design to transmit emotions to products which could satisfy consumers emotional desires.

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Industrial design · Design process

1 Introduction

The importance of emotional design on product development has grown significantly over the past few decades. Industrial designers have gone from simple-minded functionality to a conception where their main purpose is to create products and experiences that can build emotional, deep, long, and long-lasting bonds with users (Roberts 2005). Consequently, several investigators and companies started to research and develop different ways to introduce emotional design within the design processes. Methods like Kansei Engineering, Kano Method, and Semantic Differential have been developed to understand users' emotional desires. Several categorizations of emotions along several dimensions were made. Some of them were based on arousal and valence (Hepach 2011), some others were based on the subconscious level on which they acted (Norman 2004). After the development of these methods, investigators and design professionals started to apply emotional design in their projects to create meaningful and more personal products (Norman 2004; Spillers 2004; Desmet and Fokkinga 2013). Some studies have brought up exciting and revealing news about emotions, as their deep correlation with decision making (Gray et al. 2002) or their capability to overrun cognitive barriers when it comes to product appreciation.

Nowadays, industrial designers face several difficulties when they apply emotional design into their projects. For this reason, the objective of this chapter was to provide to the industry a series of recommendations for the application of emotional design during the design process. The present research was divided into two parts. First, a series of recommendations were created to facilitate the application of emotional design during the design process. Later, these recommendations were handed to a group of industrial design students who applied them on one of their projects. As the recommendations are solely for the conceptualization phase, the resulting pieces were not graded on the emotional response they may or may not have caused; they were rather analyzed in search of concepts related to emotional design.

1.1 Introduction to Emotional Design

Emotional design, just like the industrial design and design itself, has received several different names, such as hedonic design, affective design, the design of human affective factors, and empathic design, among others. Although there is no clear or ultimate definition of what emotional design is, it seems that it is a branch of design that has made its main purpose to study the role that human emotions play

as an influence on how we interact with different objects and artifacts (Aumer-Ryan 2005).

Typically, the design used to be divided into two fundamental aspects: emotive and rational. The common thinking was that they should be separated, furthermore, the rational aspect of design used to be prioritized over the emotional side. In (Gray et al. 2002), the study reinforced the theory that emotional states are associated with the different ways we process information, and in a deeper layer, with the decision-making process.

How is emotional design relevant to industrial design? Emotions have powerful effects on the decision-making process of people; hence, they play a key role when users must decide whether they like a product or not. When it comes to the appraisal of a product, emotions have the capability of overrunning the logical and cognitive walls of users, meaning that in many cases, emotions will determine if a user likes a product or not, despite cognitive factors.

The role that emotions play when deciding whether someone likes an object or not has proved to be so strong that they can be more important than functionality or usability factors. It is not whether the product works or not. The important matter is how a product makes the user feel. According to Norman (2004), on many occasions, the true value of a product is not directly related to its intrinsic characteristics. Instead, it relies on the emotional connection that bounds the product to the user. In some cases, emotional design can have an impact not only on how the user perceives the product but on how it makes the user relate to other people.

When it comes to new products, it seems that context and emotions have a direct impact on how people receive jumps on innovation. A study conducted by (Carbon et al. 2013) concluded that we are keener to appreciate innovation in a positive way when we feel safe about these innovations. For example, we are more receptive to extravagant and unconventional cars if they are presented to us in a car show as we are prepared to see new and uncommon things.

1.2 Review of Tools for Emotional Design

As it was mentioned before, several tools have been developed to achieve a design approach that envisions products that meet the user's desires. Nevertheless, these tools or methods are not specifically designed to guide the designer towards the creation of an object that triggers an emotional response. Kansei Engineering and Kano are the main emotional design tools that have been applied in the industrial sector. Some examples of the application of these methods can be found in the scientific literature, see Table 1.

Kansei Engineering provides information regarding what the user expects to see in a product, by asking a test group for their impressions of determined concepts or products. The test group gives their opinion on how they understand or like a product.

Table 1 Examples of Kansei Engineering and Kano methods application

Title	Methodology	Contribution	Reference
Satisfying emotional needs of the beer consumer through Kansei engineering study	Kansei Engineering	Describes the use of Kansei Engineering type I for the category classification of beer cans and the identification of the design elements that can satisfy emotional and sensitive needs (sense of vision)	Hirata et al. (2004)
Affective engineering in application to Bi-level human migration models	Kansei Engineering	A bi-level human migration model using the concepts of affective engineering (*Kansei* Engineering) and conjectural variations equilibrium (CVE) is developed	Kalashnikov et al. (2014)
Emotions and the urban lighting environment A Cross-cultural comparison	Kansei Engineering	The article shows the main results of an empirical research about the relation between emotions and urban lighting scenarios	Calvillo Cortés and Falcón Morales (2016)
An integrated approach to innovative product development using Kano's model and QFD	Kano model	The article analyses the notion of customer satisfaction based on the Kano model and points out the importance of product innovation in exceeding customer satisfaction	Shen et al. (2000)
Understanding customer needs through quantitative analysis of Kano's model	Kano model	A new model is developed to study the relations between customer satisfaction and the fulfillment of customer requirements	Wang and Ji (2010)
Integration of FMEA and the Kano model: An exploratory examination	Kano model	A new approach is proposed to enhance FMEA capabilities with Kano model. This includes determining the severity and "risk priority number" (RPN). The approach prevents failures at early stages of design	(Shahin 2004)
A fuzzy-AHP approach to prioritization of CS attributes in target planning for automotive product development	Kano model	The article analyzes the lack of quantitative data and undefined relationships between the attributes that make difficult to develop a quantitative model for analyzing subjective customer satisfaction (CS) attributes	Nepal et al. (2010)
Kano Model and QFD integration approach for ergonomic design improvement	Kano model	The article presents joining methods of Kano Model and Quality Function Deployment to improve the school workshop's workstation design for adolescents regarding ergonomics and users need	Hashim and Dawal (2012)

Methods like Semantic differential are based on bipolar concepts tests that, although somewhat provides information regarding how the user feels towards certain concepts, by itself it does not represent design considerations that could be used by the industrial designer who strives to trigger emotional responses with its product. Furthermore, the selection of bipolar concepts rely entirely on the design researchers, so these concepts tend to be subjective (Mondragón Donés et al. 2006).

Kano Method is another option to approach user's desires regarding product design (Beitia et al. 2009). Based primarily on assessing the degree of satisfaction that a product achieves on its users, Kano method consists of a series of multiple answer questions oriented to find out what users like better. The three main aspects that this method tries to determine are the degree of satisfaction with the functionality of a product; things that the user asks of the product; details that would make the product more pleasurable to use (Álvarez et al. 2008).

These previous methods require a considerable investment of time, resources, and knowledge, and the results are presented in the shape of statistics and data that require experience for their interpretation (Bradley and Lang 1994). Furthermore, these processes tend to be lengthy and exhaustive.

Some other tools, like the Geneva Emotion Wheel (GEW) (Sacharin et al. 2012), PrEmo (Desmet et al. 2012) and Self-Assessment Manikin Scale (SAM) (Bradley and Lang 1994), have a deeper connection to the emotional side of design. They are tools that are very effective measuring the emotional response of people towards certain objects or concepts through visual aids.

Trough anthropomorphic images, PrEmo, and SAM Scale can effectively determine whether a product triggers an emotional response, what kind of emotion, and the strength of this particular emotion. Being based on graphic tools, these methods can transcend the barrier of languages, as the emotions expressed on the images clearly show moods and sentiments.

GEW is a tool similar to the past two, though, while SAM and PrEmo use images to fulfill their purpose, GEW uses a graphic from which the surveyed can pick an emotion and how strongly they feel it, dividing these parameters on Positive/Negative emotions, and High Control/Low Control of these emotions. This allows GEW to be applied on a variety of fields, form decision making to user experiences (Sacharin et al. 2012).

Described present important knowledge about emotions and how they relate to design, yet, none of them actually tells how the novice designer should approach and conceptualize based on users emotions (Desmet and Fokkinga 2013).

1.3 Difficulties for Industrial Designers

Industrial designers who want to include the emotional aspect of design into their projects are then faced with a series of difficulties, which are given as follows:

- Although there is a fairly good amount of information regarding emotional design, most of this information is about emotional design but not about how to apply it.
- For the industrial designers that have never heard of, or know little about emotional design, it can be very difficult to apply it, as there is no established method, manual or guide that helps them on the purpose of creating objects which target is to trigger emotional responses.
- Most designers will feel lost when trying to apply emotional design, as there is no reference on how to do it.
- The methods that are the closest to emotional design (such as Kansei Engineering) require quite an amount of time, resources, and knowledge that may not be available to the grand majority of industrial designers.
- Great tools such as PrEmo are effective for measuring the emotional response, but they do not provide design guidelines for the industrial designer, their purpose is to measure results.

When comparing some of the methods used for emotional design (Table 2), we can observe that although they are successful in some ways when it refers to reach or measure emotional design, none of them was created to actually tell the designer how to design emotionally.

As a result, we can think that a possible solution to this situation is to create a series of recommendations for the industrial designer, based on emotional design, that will be capable of orienting designers on what concepts and knowledge can they rely on, in order to create objects that will capitalize on human emotions to become successful products.

Table 2 Comparison between six different tools oriented to find out consumer's preferences and emotional impact of products

	Kansei	Kano	SD	GEW	PrEmo	SAM
Based on surveys	*O*	*O*	*O*	*O*	*O*	O
Fixed answers given by surveyors	**X**	*O*	*O*	X	X	X
Limited amount of possible answers	**X**	*O*	*O*	*O*	*O*	O
Considers emotion	O	**X**	**X**	*O*	*O*	O
Considers cultural background	**X**	**X**	**X**	**X**	**X**	X
Considers functional aspects	*O*	*O*	*O*	**X**	**X**	X
Considers aesthetic aspects	*O*	**X**	*O*	*O*	*O*	O
Considers what the subject desires as design criteria	*O*	**X**	**X**	**X**	**X**	X

(continued)

Table 2 (continued)

	Kansei	Kano	SD	GEW	PrEmo	SAM
Uses visual aid to formulate answers	**X**	**X**	**X**	*O*	*O*	O
Measures emotional perception of a product	**X**	**X**	**X**	*O*	*O*	O
Aids in the design process	*O*	*O*	*O*	**X**	**X**	X
Gives EMOTIONAL based design guidelines	**X**	**X**	**X**	**X**	**X**	X
Affordable for small design studios/ independent designers	**X**	**X**	**X**	*O*	*O*	O
Requires economical investment to conduct study	High	Medium	Medium	Low	Low	Low
Requires time investment to conduct study	High	High	High	Medium	Low	Low
Requires logistics to conduct study	High	High	High	Medium	Medium	Medium

2 Methods

2.1 Creation of Recommendations to Apply Emotional Design

Even though there is not a specific guide to apply emotional design in the conceptualization process, there is plenty of information related to emotional design. Several important investigators, like Don Norman, Frank Spillers, Jodi Forlizzi, and Pieter Desmet have published various books and articles related to it (Desmet et al. 2012; Norman 2014; Spillers and Asimakopoulos 2014; Forlizzi et al. 2016).

A series of recommendations and knowledge key points were conceived from the study of diverse emotional design books, articles, reviews, and various industrial design methodologies, as well as a deep insight on how the mind works and on empirical observation of human behavior. These recommendations are focused on the conceptualization phase of the design process. It aims to give designers valuable information and tools for product conceptualization, which introduce the emotional side of users as the main criteria. The recommendations do not try to tell designers how to conceptualize. They are a gathering of concepts and knowledge about what

triggers emotions on users, and how taking this knowledge into consideration might help designers reach a desirable level of emotional design. These recommendations present themselves as a serious option for designers who need a hand on understanding and designing with emotional values.

In the analytic part of the process to create the recommendations, an investigation was made about emotional design and a breakdown was started, separating its elements, both primary and secondary, to achieve a better understanding of this phenomenon. In the synthetic phase of the investigation, it is necessary to add knowledge that did not exist previously. The synthetic phase is somewhat difficult to acquire, for it is based on reflexive intuition and common sense.

The recommendations are grouped in a list and are based primarily on two factors: personal conclusions and appreciations regarding emotional design based on analysis and reflection of the gathered information, and accepted concepts within the emotional design field, proposed by various experts.

The following is a brief and simplified list of these recommendations and knowledge key points:

1. From the beginning: "Emotional design must be a fundamental part of the design process from the very beginning; it cannot be applied when the product is already finished" (Desmet et al. 2008).
2. Mood: there is evidence that a cheerful mood predisposes designer to design better solutions.
3. Eliminate preconceptions: Designers must not have preconceived ideas since the recommendations focus on the conceptualization phase. The process must start from zero.
4. Determine design possibilities: the designer must determine what the design possibility that he/she pursues, hence, the type of product that might be required is.
5. Market research based on emotional qualities: compare a similar product on the market to determine their existing emotional characteristics that designers must identify.

- Type of emotion that the product evokes: the designer must ask himself and try to determine what emotions and emotional relationships develop between the user and the product.
- Emotional level on which it acts: the designer must identify on which of the three emotional levels proposed by (Norman 2004), the product acts.

   i. Visceral: exclusively based on the looks of the product. In this level, it is all about the formal and physical characteristics of the object.
   ii. Behavioral: it is determined by how the product is used.
   iii. Reflective: determined by knowledge and cultural baggage. It is the deeper and strongest emotional level.

6. Verbalizing is another form of design: the designer must learn to write down all of his/her ideas. It is fundamental to put down on paper the designer's ideas, for this is the first step to materialize them.

7. Mood boards: these are visual tools that support the designer when it comes to the creation or conceptualization maps and models. They help the designer to better determine the kinds of emotions that should be imprinted on the design.
8. Emotional Design Intent: this is a short and concise statement where the designer exposes the emotional level and kinds of relationships that he/she seeks to awaken in users who are using his/her product. It will serve as a future reference and guide for the designer.
9. Cultural contextualization: emotional design is deeply linked to the cultural values of the user. It is essential that the designer is aware of this and, hence, be able to identify these values (Aumer-Ryan 2005).
10. Subcultures contextualization: the so-called "protocultures" are also a differentiating factor for users, it is necessary to know them to exploit their properties for design (Lloyd et al. 2006).
11. About the aesthetics: the adage "form follows function" is being replaced by a new one: "if it looks good, it works." It is vital to understand the value, impact, and significance of the formal design. "…it requires a somewhat mystical theory of aesthetics to find any necessary connection between beauty and function" (Tractinsky 1997).
12. Aim for beauty: concepts that are considered as beautiful often have positive effects on users, affecting them on a visceral emotional level and affecting the perception of use easiness. To identify and apply these concepts to product design is vital to achieving a greater degree of acceptance among users (Tractinsky et al. 2000).
13. The personality of objects: humans tend to read each other's emotions. We have a great capacity for emotional interpretation, so much that we carry this ability to analyze the degree of inanimate objects. This feature allows the designer to give personality to objects so that they convey emotion, mood or personality.
14. Understand the effects of shape on the subconscious: certain physical characteristics often have different effects on the emotional reaction of the users. The designer must understand, for example, the calming effects of a sinuous and curved shape, or how a "heavy" or "bulky" shape can determine whether a product is attractive or not (Spillers 2004).
15. Anthropomorphizing: within the personality spectrum of objects, you may find the effects of product forms. As humans, we have a natural tendency to feel empathetic toward our species. Applying human traits and characteristics to objects has implications on the user's degree of emotional reaction. The designer should be aware of these consequences and use them in benefit of their product (Hepach 2011). An example is emotion recognition includes the capacity to read and interpret other people's emotion.
16. About objects attitudes: As with personality, it is possible to provide objects emotional states. The designer must understand how to make the object look "anxious" or "relaxed," for example. Giving emotional states to objects will cause the user to inadvertently interpret these emotional states, and feel the product differently.

17. The pride of possession: this factor has become one of the most important on nowadays product design. To make users identify themselves with products, to the point of actually feeling proud or "better" for owning them has become a factor that may determine the success or failure of these products. It is necessary to understand how to make the users acquire products, not because they need them, but because they want them.
18. Emotional memory: this is the name given to a series of concepts, memories, and experiences that the user accumulates throughout life. Emotional memory determines how the user responds to these certain concepts. Understanding these reactions and experiences, allows the designer to exploit them in order to achieve the desired emotional reactions (LeDoux 2000).
19. Establish contact with the designer's inner user: the best reference that a designer can have on the emotional impact of the objects is the designer itself. By abstracting from his/her professional skin, designers will be able to better understand the emotional impact of their own ideas (Lloyd et al. 2006).
20. Consider all aspects of design: when conceptualizing, the designer must take in account how the user should feel when holding the product in their hands, how should it smell, how much should it weight. The use experience plays a fundamental role in the emotional design.
21. Every aspect of the design must have a function: even if the sole purpose of the design is to look good. Every aspect of the design must be justified; it must have a reason to be. The consequence of adding details without purpose is having empty and meaningless products.
22. The artistic value of emotional design: design by conformity will almost always produce good and pleasurable products that most people would like. The true artistic value, however, is hardly achieved by consensus and almost always corresponds to the personal view of the designer or a small group of creative people. The designer must determine what kind of product he/she desires and intents to deliver; for it is through this contact with the user that designers can really persuade them that their vision is what the consumer wants (Crilly 2011).
23. 23.The golden ratio: also known as the golden number, Phi, Fibonacci sequence or divine proportion, the golden ratio is equal to 1.618. It has been shown that this ratio is found in many elements in nature. Its application provides balanced aesthetics and natural symmetry to objects. It is a good idea to have this proportion in mind when designing, as its correct implementation tends to generate positive affective responses on users.

2.2 Recommendations Validation

It becomes difficult to objectively appraise if these recommendations help designers to apply emotional concepts into their projects. An investigation could be

conducted by analyzing products that resulted from conceptualizing with these recommendations and finding out if these products produce emotional responses, probably using tools such as PrEmo or Geneva Emotion Wheel. The results would not be conclusive as they would depend greatly on the individual capabilities and abilities of each designer.

Furthermore, the conceptualization phase of the design process does not include any sketching, designing or prototyping per se; it is based solely on the creation of ideas and concepts that will later become a design and, validating a process that focuses on ideas can be very subjective. Even so, there must be a way for these recommendations to be evaluated.

A study group made out of nine students from the Industrial Design Program, at the University of Ciudad Juárez, México were asked to apply these recommendations on one of their school projects and then submit these projects to analysis. It is not the purpose to determine if the design is good or not, but rather determine if the design presents characteristics that can be associated with the emotional design.

Characteristics of the study group:

- A small group of students of medium-advanced level applied the recommendations in the conceptualization phase of their projects.
- The students have never followed emotional design-based recommendations, guidelines, or whatsoever in their conceptualization processes before.
- The students did not know they were going to follow these recommendations on their projects until the day they were assigned with the design project.
- The students had approximately five days for the conceptualization phase.
- The students, after the conceptualization phase, continued with the sketching, definition, and prototyping phases of the design process.
- As a limitation, most of the projects have a requirement to be based on biomimetic, and several of them were required to be a luminaire project. Since deconstructing the resulting projects could be so subjective, another parameter must be considered to measure these recommendations.
- The resulting projects were analyzed to identify the presence or absence of concepts related to emotional design mentioned in the recommendations.
- Personal appraisal is given by the students about the recommendations. This appraisal was given through a survey oriented to find out the student's opinion regarding different aspects of the recommendations.

2.3 Designer's Appraisal on Recommendations

To find out the student opinion, a survey was applied to the study group. This was not oriented to determine the effectiveness of the recommendations, but its perceived effectiveness. The questions were made to determine how an individual perceived the recommendations, their experience using them, and their opinion.

The main aspects that were treated in the survey were the following:

1. Usefulness
2. Easiness of understanding
3. Relevance to the field
4. Effect on their design process
5. Effectiveness of recommendations when guiding trough conceptualization process
6. Effectiveness of recommendations when transmitting emotional design concepts
7. Overall opinion on the recommendations
8. Suggestions and improvements

3 Resulting Projects

As a reference of the resulting projects, graphic representations are presented; either photorealistic images (renders) or actual photographs of the prototypes. Luminaire pieces were submitted to scrutiny as a final semester by the head teacher of that assignment and by an evaluation committee to determine the quality of the design. Also, a design researcher analyzed the resulting projects in search of the emotional concepts presented in the recommendations. Non-luminaire projects were only scrutinized in search of emotional concepts.

3.1 Case One: Cuack!

The project proposed in Fig. 1 required to be a luminaire. The designer focused, during the conceptualization, on creating a design that evokes cuteness applying some recommendations, such as number 12 and 13. The recommendation 12 aims for beauty and the 13 creates personality—in this case of a duck—through simple lines and forms, this design attacks the visceral level of emotion, having its main

Fig. 1 "Cuack!" Luminaire, by Luis Peón

strength in the visual memories that it triggers. It is made of acrylic and steel, with an interior LED illumination.

3.2 Case Two: Nautilus Chair

As shown in Fig. 2, this chair required to be based on biomimetic. The designer was inspired by the shell of the marine creature nautilus to produce a chair made of molded urethane. In this product, the recommendation used was number 23: the application of the golden ratio.

3.3 Case Three: Periodic Table

The emotional value of Fig. 3 product relies principally on two recommendations: number 17 and 18. The first one, the pride of possessions attacks the reflective level of emotions by substituting the traditional elements with a series of music rock bands and musicians. This creates a sensation of identity that will appeal to users individually according to their musical tastes. The second recommendation evokes

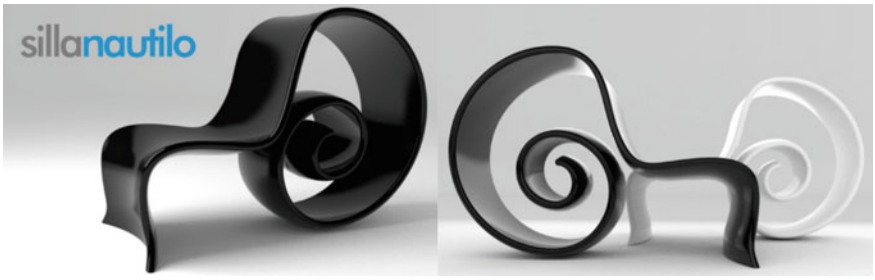

Fig. 2 Concept, "Nautilus chair", by Diego Díaz

Fig. 3 Concept, "Periodic Table", by Nestor Hernández

nostalgic memories, using a periodic table that takes people back to the school and childhood. It is made of molded polypropylene.

3.4 Case Four: USB Invaders

In Fig. 4, the emotional design concepts of this piece are related to the recommendations 9, 17, and 18. According to the recommendation 9, cultural contextualization, this product using the famous game Space Invaders establishes a relationship with a generation that had it—the culture of gaming. It also creates a nostalgic reminiscence (recommendation 18) making those who played this game remember the 80s. At the same time, using a widely known concept aims to users to have it appealing to their sense of individuality because it is a vintage piece, as the recommendation 17 indicates.

3.5 Case Five: Rosy

Figure 5 illustrates a luminaire based on biomimicry of flamingos. The emotional recommendation applied in this design is number 13, giving a personality of

Fig. 4 Concept, "USB Invaders Flash memory device", by César Rodríguez

Fig. 5 "Rosy" Luminaire, by Daniela Camargo

flamingo. The shape of each piece is based on the flamingo's neck, yet, when faced one another they form the shape of a heart, alluding to the love and beauty these animals are often related to, as the recommendation 18 says. This luminaire can only be lighted when they are close to each other. It attacks two emotional levels: the behavioral level by changing the way these luminaires work (the need of being close to each other), and the reflective level by using emotional memory to recall romantic sentiments. It is made of oak and mahogany.

3.6 Case Six: Tokay

As can be seen in Fig. 6, this project required to be a luminaire based on biomimetic. The designer focused on a Leaf Tail Gecko and tried to imitate the tail of an animal. It is complicated to detect any of the emotional conceptualization recommendations presented in the study. It may be said that the sharpness of the lines and materials can evoke a sense of edginess, but it cannot be completely said that the designer result provokes a clear emotion. It is made of pinewood and stainless steel.

3.7 Case Seven: EARS

The project in Fig. 7 required to be a luminaire. The designers applied the recommendation number 13 in a rather interesting way. Understanding the cautious nature of rabbits, they gave the personality of this animal placing it on a corner in the ground. The users only observe the ears and eyes of the rabbit showing up, as if it were looking outside from safety. This gives the design a sense of aliveness that triggers emotion on users. It is made of stainless steel.

Fig. 6 "Tokay" Luminaire, by Alfonso Rojas

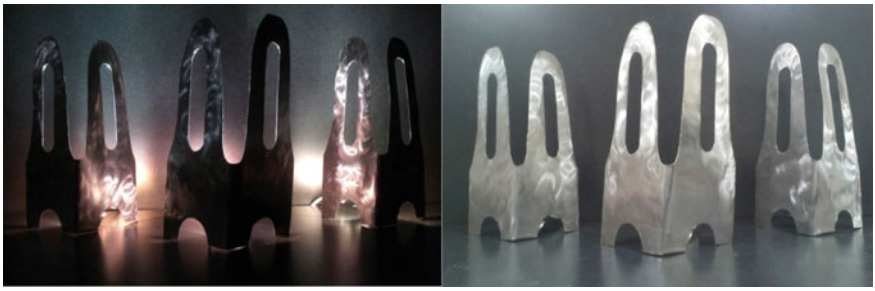

Fig. 7 "EARS" Luminaire, by Brandon Rivas

3.8 Case Eight: Colibrí

This project required to be based on biomimetic. In this case, the design of Fig. 8 chose a bumblebee as the most significant analogy. It can be said that the curviness of lines might produce some sensations, as calm, but it cannot be assured that this was the intention of the designer. So, it this product cannot be identified which recommendation used the designer in the conceptualization phase. It is made of oak and styrene plastic.

3.9 Students Survey

Based on the answers given by the study group, the following statements can be made:

1. The reading of the recommendations is entertaining and easy. Every answer in that regard qualified them as either "entertaining" or "very entertaining". According to that the recommendations can be consulted or read again easily.

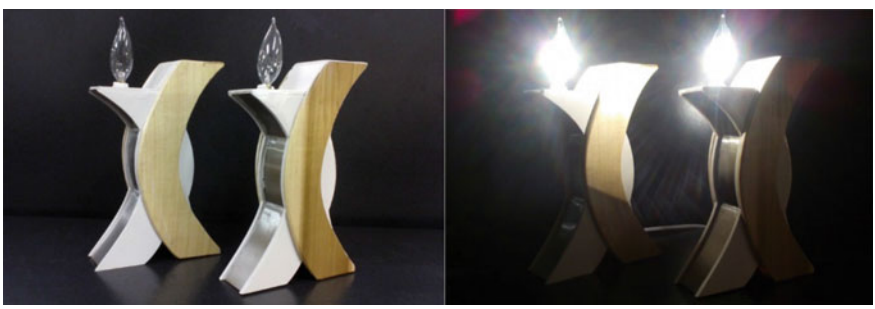

Fig. 8 "Colibrí" Luminaire, by Ailin Terrazas

This also helps to share the recommendations with other designers and engineers.

2. The designers felt the concepts were easy to understand. It means that the difficulty will not disserve the applicability of these recommendations. The doubts will not stop designers to apply them.
3. From the study group, only a 15% declared to have notions on what emotional design is; the rest admitted that it was a new concept for them. This could be a problem for the recommendations, as the designers jumped into a field they knew nothing about, yet, this also means that it was a perfect chance to test the capabilities of the recommendations when introducing designers into the world of emotional design. The recommendations present an opportunity for the designers to have an expertise in emotional design and improve their products.
4. Eighty percent of the study group feels that they now have good fundaments on how to conceptualize based on emotional design. The rest believes to have gained a medium amount of knowledge about it. Nevertheless, information related to point three underlines that these recommendations had improved the knowledge of the participants, and they felt sure about the application of them.
5. Eight out of nine designers confessed that they are not used to implement the conceptualization phase on their design processes. This might affect the study in two manners: on one side, not being familiar with the conceptualization process might make a first contact tedious or useless; on the other side, it grants the possibility to generate a fundamental working habit on the design process of these individuals. If they learn and internalize this habit, later on, they can work starting from a good base.
6. The entirety of the study group feels that the recommendations do manage to provide a good starting point for their design conceptualization. They believe that emotional concepts are well presented and grade the recommendations as either "useful" or "very useful". Furthermore, they claim that they would use it again and that they would recommend them to other designers. It is a positive result, in the sense of sharing knowledge and propose improvements in the future.
7. The study group felt that there is space for improvement, as a third of the designers spoke about the need for more and more explicit examples for each of the concepts on the recommendations. These examples can summarize all the information and promote a better comprehension, according to the different ways or manners of design.

4 Conclusions

Although the recommendations are at an early stage, five out of eight of the resulting projects managed to incorporate values and concepts related to emotional design. Several of the projects concluded in the design of a luminaire based on

biomimetic. It could be considered a positive result if it is taken into account that almost all of the student designers had no real knowledge of emotional design and no real knowledge of how to conceptualize.

Students who applied some of the recommendations on their products qualified them as useful, easy to understand, easy, and fun to read. Moreover, they agree that the recommendations are a good starting point for their design processes when aiming for emotional responses.

Finally, according to resulting products designed by students, it seems that these recommendations can help industrial designers to transmit emotional concepts to products. These strategies could be of great interest for industries to develop products which could attract new consumers by addressing their emotional desires and needs.

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