Emotional Impact on Furniture Design (Action & Reaction)
User-Based Approach

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DECLARATION

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethical procedures and guidelines have been followed.

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Braunschweig, 27th of March 2014

<u>Abstract</u>

Emotions are the most sensitive engine of everyday life as they are the daily experience of everyone. When designers can control emotions with their designs, they can communicate with users. However, the "first impression" is the designer-user's first communication point; it controls users' purchase choice, as people without emotions, as in Damasio´s study, are often unable to choose between alternatives, especially if each choice appears equally valid. So, orienting the users' first impression positively may direct their purchase decision to repurchase the product. Also, the experience with the product- especially those with long-term lifetime usage requires emotionally designed products to accommodate the negative emotions stimulated during this long time experience. Those emotionally designed products need a specific designing strategy that can fulfill users' emotional needs to turn them into reality. Moreover, the positive emotions such as happiness, attractiveness, surprise, interest, trust, and fun need to be supported and evoked by the design from the very beginning of the design process and throughout the experience time.

Norman's three levels of perception and Plutchik's wheel of emotions have been used in a research methodology, to develop the design process to result in an emotionally communicative product. This method is developed based on a particular strategy, tools, and stimuli, by involving particular users in the entire design process, designing for re-configuration, and following-up on the user's relationship with products to accommodate the negative emotions that have been elicited through their experiences with the products. This method has been used to provide users with aesthetically and emotionally dynamic products that enable them recovering the positive feelings that influenced their purchase decision. An application structure was designed and used. This outline is based on identifying emotional design characteristics of a pre-specified users' target group, and then fulfilling their emotional needs by involving them in the design and product evaluation process, to ensure a user's positive first impression with pleasant surprises at purchase, and then extending this pleasure as long as possible.

To

My Mother's and Father's Soul

ACKNOWLEDGMENTS

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This chapter is an introduction to the main focus of this research (Emotional Design). It outlines the scope and structure of the thesis as well as the research problem and questions such as how to create an emotional product based on balancing the designer's emotions with the users' emotional needs, and how to achieve stable and positive experience for the user. This chapter also mentions related previous works in the field of emotional design and other relevant concepts, as well as clarifying the research goal, which is evoking, rather than measuring, positive emotional responses as well as offering users a higher level of emotional satisfaction.

Chapter 1

Introductory Review

1.1. Introduction

Understanding what emotional design should be and emotion's role in various aspects of design, represents not only the goal of this research, but also the goal of much research, since there have been many studies focusing on analyzing it with great success. Some scholars and researchers have regarded emotion in design as a tool that designers use to deliver their messages and feelings, whatever the users' emotions and feelings are. While others believe that emotions are a kind of experience or response when an individual is using an object. A third group focused mainly on revealing this relationship among users, products, and users' responses (Amic, 2008).

However, in addition to Robert Plutchik's model (Plutchick, 1980), who classified emotions into eight basic emotions, there are three levels of perception that may provide the required knowledge to deal with emotional product design; these levels are (Norman, 2004):

- **Visceral** (also called reactive): where emotions are quick, evolutionary responses, relevant in regards to the product's visual appearance.

- **Behavioral:** where emotions coincide with bodily activity, and are related to the pleasure and effectiveness of use.

- **Reflective:** where emotions occur at a contemplative level and relate to the rationalization and intellectualization of a product.

These three hierarchical levels of perception are interwoven through any design, and they represent three important axes that can be focused upon in order to find an effective strategy that can be used in creating an emotional design (Norman, 2004). Perceiving design takes place firstly at the visceral level, and in a deeper sense at the reflective level. This means that design itself should touch the user's feelings through the visual aspect or appearance, as well as by more emotionally in-depth design and positive memories that aim at users' satisfaction (Kejun, 2008). The importance of emotions is represented by the objectives that provoke strong positive emotions such as attraction, attachment, and happiness (Parker, 2007). At the same time, emotions follow behavioral and psychological reactions, as cognitive processes are central to emotional experience (Parker, 2007), and they are more than simply the joint effect of both physical reactions and cognitive appraisal. Emotions should be included in any design or product as a personal component as well.

In the field of emotion and design, there are pleasant surprises, just as there are unpleasant ones; it depends on the hedonic quality embedded in the design. Tendencies in motivation related to positive or negative surprises are activated depending on the object's emotional

attraction or lack thereof. In other words, surprise is an exception (Deonna, 2012), and satisfaction may mean the design is such an exception. Pleasant surprise, and subsequent positive experience with the product should be the designer's goal. As by meeting the users' expectations, and then offering them positive experience, and following up on users' emotions during their experience with products, will increase the product's success and offering users a higher level of satisfaction. With this in mind, this research contains two basic concepts in an attempt to affect this experience positively, at least by making it stable. These two concepts are as follows:

- **Action:** Represents the designer's static emotions after the product has been produced and purchased (Action). These emotions were dynamic when they controlled his thoughts during the design process, worrying about this design to succeed or to fail, as designers inject their emotions in the design process to achieve the design outcome (Amic, 2008).

- **Reaction:** The user dynamic emotions at purchase, after purchase and while experiencing the product. The user-product relation relies on those dynamic emotions raised as a result of contact with the product, and it is formulated according to the positive or negative emotions evoked because of this product. The user's changeable emotions (Reaction), according to this research, are intended to be stable (Fig. 1-1), in order to obtain positive and strong designer-product-user connection. This underscores the need to find developed design methods to produce emotional products, which in turn will ensure the user's positive emotional experience.
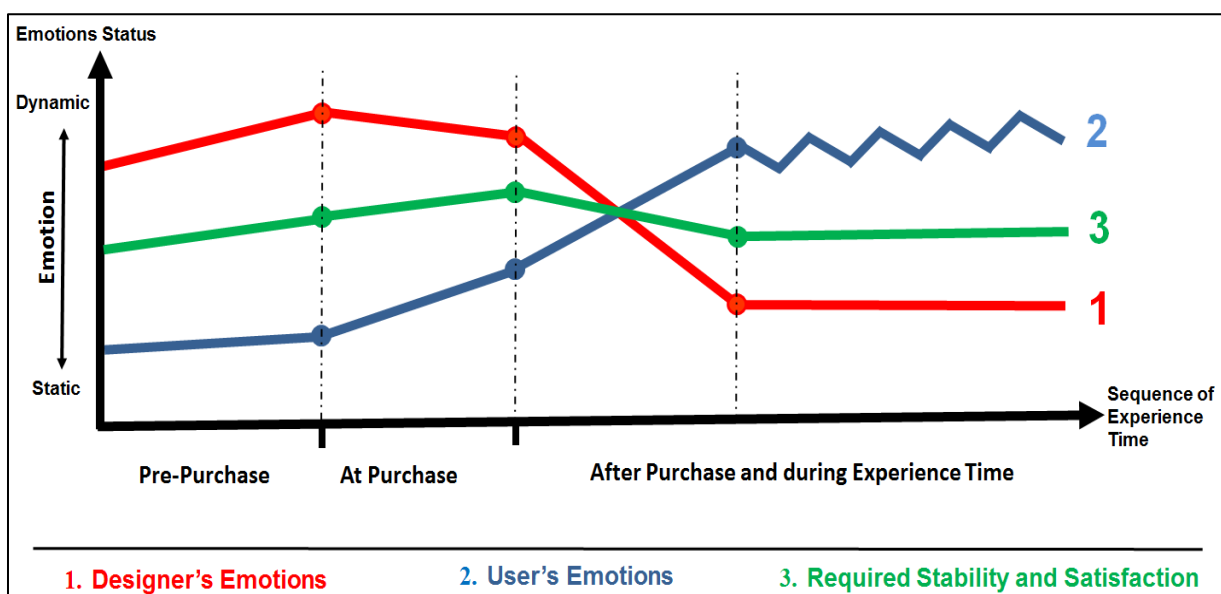
Fig. 1-1: Three levels of designers'/users' emotional responses: Pre-purchase, purchase, and post-purchase, and the required stability in user's emotional satisfaction.

In summary, in observing user responses, the tendency is to clearly classify emotions into positive and negative frames, and assume that the product is succeeding when positive emotions are displayed and failing when negative emotions are displayed (Aumer-Ryan, 2005). However, this research is an attempt to develop the design process to include a fixed sequence and particular tools, and proceed in specific procedures, to result in an emotionally satisfying product. This end requires maximizing the opportunity of the positive emotions and minimizing the negative ones. Therefore, focusing on many disciplines related to emotions, psychology, perception, and design process, is required to reveal the most appropriate strategy that can be applied to combine these disciplines in a scientific structure.

1.2. Emotional Design Concept

The design process of product creation has many factors to be considered. These factors include the choice of material, manufacturing method, the way the product is marketed, cost, practicality, and how easy the product is to be used and/or understood. Many people don't realize that there is also a strong emotional component to how products are designed and put to use (Norman, 2004). Some approaches associated with emotion in design tend to view emotional content as noise affecting otherwise standard data (Aumer-Ryan, 2005). In fact, the product's emotional design determines the consumer's first impression, which in turn accelerates their communication with the product and recognition of its advantages. Furthermore, the visual appearance of the product influences user evaluation and choice of a product in several ways; if alternative products are similar in terms of function and price, users will prefer the most aesthetically appealing product (Creusen, 2005). Accordingly, the main focus of this research is on design appearance and attractiveness, after ensuring functionality and usability features, of course.

Designing for appearance required choosing a piece of furniture "A Coffee Table,, to be an application of an emotional design concept as well as a translation for the development of tools and techniques that facilitate an emotion-focused design process. The idea is to emphasize the role of appearance in design acceptance, as pure appearance plays the main role in the issue; beauty is on the surface, and the main factor in decision making (Norman, 2004). Therefore, the designer should focus on creating products that will be attractive in the long term, well beyond the moment of purchase, for more user enjoyment, and deeper and more positive user-product relation that ensures the user does not become bored with the product. This represents a very significant goal for the designer to take into consideration.

1.3. User-based Approach

In finding solutions for design problems, there are four approaches that have been used to create successful products (Saffer, 2007). These four approaches have been defined and clarified by Desmet and Hekkert (Desmet, 2009) as follows:

- **Research-based approach:** Emotional measurement is applied to reveal design decision and emotional response dynamics.

- **Designer-based approach:** Designers role in the design process is much more intellectually independent; their concern focuses more on communicating ideas with their designs rather than pleasing users.

- **Theory-based approach:** Requires existing products and users who are familiar with these products. This approach is primarily suitable for product optimization.

- **User-based approach:** Focuses on user emotional needs and experience. It can be facilitated by involving users in the design process, using their feelings and aspirations as the creative driving force. This approach depends on a very simple philosophy which is: the users know best (Saffer, 2007). Moreover, it can be used for looking for ideas and opportunities to fill unmet user needs by using those users' thoughts and explorations.

In this research, the user-based approach will be used to emphasize that user involvement leads to more emotionally effective and efficient use of the product, without negative emotions such as boredom. In addition, one of the most known methods, which is actually not completely new and is used for involving users in the design process, is co-creation or co-design. In these processes, there is a shift from user-centered approach and design "*for*" to co-designing and design "*with*", where users are involved as co-designers from the very beginning of the product design process.

The main motivation associated with the user-centered approach is the user as subject, where the user represents the informant who supplies the designer with expertise, sharing, and conceptualizing actions in the early design stages (Buck, 2002). In the participatory or co-design approach, on the other hand, a common concept is to consider the "user as partner" (Gregory, 2003). This partner is the person who has the power to help designers to accomplish the whole designing process successfully, and this partner plays the role of evaluating the design that has been created for him once it is complete. Increasing the chance of product acceptance by users is still the main goal of almost every designer. Therefore, the user-based approach is used for avoiding unused, little-used, or un-enjoyable products, it is about

usability issues (Desmet, 2009), while the co-design approach improves the level of user enjoyment and acceptance of products. There is a transition in the field of social and design science from changing to design **with** instead of **for** users. While the fields of user involvement and participation in the design process have expanded to include several concepts, they are all focused on designing with them.

1.3.1. Knowing and Understanding Users Holistically

Understanding users holistically is an effective and efficient way to design an emotional product based on human emotional needs- not only according to normal human factors, but considering specifically the people for whom the product is being designed (Jordan, 2003). Therefore, the target group consists of 42 product design students as participants, and they have been selected with some considerations, such as sufficient expertise in design fundamentals and basics, their background and knowledge about different phases, expressions, and concepts associated with the design process. Also considered in the selection process were the product design students' knowledge about design elements and components and the relation between these elements in the design's structure, final form, and aesthetics.

Participants' background in this area saves time explaining details of the tested design concept. Respondents were told about the main target of this co-design process, which is moving from a usability-based approach to an emotion-based approach to create deeper understanding of the users. It is necessary to target specific users and understand them holistically in order to suggest a module that is appropriate to every user within a category, and to explore and fulfill their emotional needs according to their attitudes, as well as their physical, cognitive, and perceptual characteristics.

This will facilitate the designer's task of ensuring them adequate pleasure during their experience with the product, which in turn results in a higher level of their satisfaction. User determination and involvement in the entire design process has some other advantages, including (Damodaran, 1996):

- The quality of the product arising from more accurate user requirements will be improved.
- Avoiding costly product features that the user did not want or cannot use.
- The levels of acceptance of the product will improve.

At the same time, specifying a target group will establish for an ideal and efficient emotional designer-user communication by accurately determining to whom designer will send the emotional content involved in the product.

1.4. Importance of Emotions Understanding for the Designer and the User

There are two types of mutual influence between the designer and the user, and it is important to understand how this two-way impact affects the designer's, as well as the user's emotions. These two-way impact types are (Kim, 2010):

- Generative emotional impact: regulates or activates the mental information process.
- Evaluative emotional impact: an emotional reaction which causes evaluative judgments on the designer's idea or even about his person.

Consequently, and because of this mutual influence, the design in this study is intended to address users' positive emotions as an attempt to specify all desirable design components and their alternatives.

This specification is to meet user's expectations as closely as possible, to establish for longer pleasurable and positive experience, and to maintain a strong user-product connection. To achieve these goals, this design method is employed to earn users' positive first impressions not only at purchase time, but also to keep this impression active throughout the entire experience. Therefore, understanding users' emotions should be at the top of any designer's priorities, and since some users have no specific requirements in their products but usability and functionality, this category of users is not included in the focus of this research. A lot of users, however, do have pre-existing emotional needs and expectations they wish to be fulfilled. There is another category of users who needs to be in the center of designers' awareness; users who have had a negative experience with their product. Regarding those users, it is important for the designer to have a deeper understanding about what caused this negative experience. Perhaps they are afraid because they were hurt by the sharp edge of a piece of furniture, which they considered a negative experience, or they experienced boredom because the last product could not keep their interest for long enough. However, in-depth understanding by the designer will help him as well as users to make better decisions in the future (Norman, 2004), and this is the origin of emotional design process development.

1.5. Research Problem

It has become necessary to understand emotions due to the major role that they play in the design process and a product's success. Some studies, theories, and researchers consider emotional design as a tool used by designers to deliver their messages and emotions, while others believe that these emotions are a response when an individual uses an object (Amic, 2008). There are some deficits in the field of emotional design such as:

- **The Theoretical and Scientific field:** there is no particular outline for a design process that results in an emotional design, especially when this design has been co-created with the user by whom it will be used (Stolterman, 2008).

  Also, the previous research in the field of emotional design did not focus on the long-term experience to make it positive and enjoyable as long as possible, especially when users' positive emotions have been changed into negative one after purchase and during experience time. Moreover, some applications -such as mass customization- have been used to fulfill user's needs in the form of customized products after the product has been already created and produced (Bardakci, 2003, Blecker, 2006), whereas, this application can be used earlier where users are able to express their needs and choose the product options by co-designing/configuration to increase the product acceptability at purchase. And then, this application can be used to re-design or re-configure this product during the experience with it to offer those users a higher level of emotional satisfaction (Fig. 1-2).
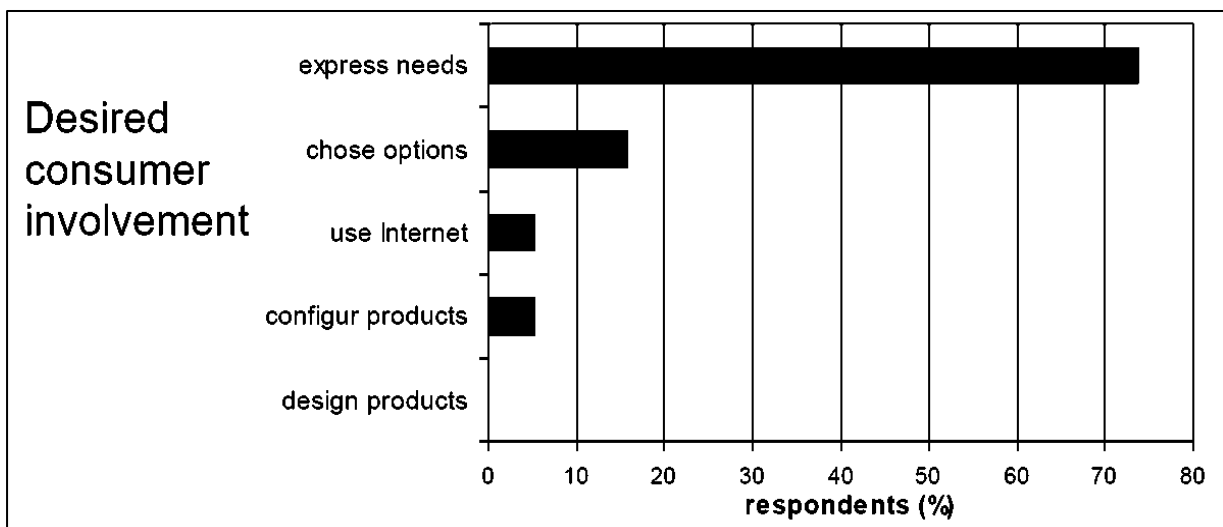
Fig. 1-2: Using mass customization to explore users' needs to fulfill them and offer them a higher level of emotional satisfaction (Lihra, 2013)

- **Types of Products:** previous researches focused on some products such as electronics and household appliances (Chapman, 2005), not including furniture as a non-electronic products, especially that, furniture has already long-term where users are exposed to lack of interest and boredom. Additionally, some emotional designs were created by accident and for a short-time impact, while it is recommended to offer the user as long positive impact as possible. Furniture is one of the most known products that have a long-term usage which increases the chance of raised negative emotions such as being bored from them.

- **Types of Emotions:** most of the studies in the field of emotional design concentrated on mixed emotions in general (Desmet, 2004), positive and negative, while this research targets evoking a specific positive emotions such as pleasant surprise, attraction, and interest. Moreover, this research focused on inhibiting and/or accommodating other negative emotions that can be stimulated because of the products which have a long-term usage. For example, boredom-as negative emotion that can be evoked by experiencing furniture for a long time- represents one of the most known reasons behind purchasing new products. On the other hand, most of researchers and scholars focused their interest on measuring the emotions evoked by these products and how to develop the way of evoking these measurement tools (Demir, 2008). However, most contemporary researchers in the cognitive tradition of emotion hold that particular types of emotions are associated with particular types of appraisals, and that emotions can be predicted from the nature of the underlying appraisal and concern. In this research view, design for emotion requires an approach that focuses on the appraisals and concerns which represented in avoiding unpleasant surprises, upgradeable co-created design, and overcoming boredom.

Additionally, the researcher's experience in the field of furniture design resulted in an appropriate feedback that supports the need for designing furniture for long-term of pleasurable usage and positive experience as well.

1.6. Research Questions

"There is no such thing as a neutral interface. Any design will elicit emotions from users, or convey emotions from its designer, whether or not the designer intends this or is even conscious of it. Interfaces can be designed for neutrality, but the effect is not neutral in the sense that it allows emotions to be neglected; instead it is a choice with its own implications"(Gaver, 1999). "One of the fundamental issues that have been discussed in the design and emotion field is the possibility of the design of experiences or emotions, but now it could be cited that it is not possible to design an experience but to design for an experience, which means shaping the product to maximize the possibility of evoking the intended experience" (Demir, 2008). However, these two statements summarize the need for designing an emotional design that offers the user positive experience is the focus of this research, thus, the research problem can be formulated by the following questions:

- How to structure a design application's outline that evokes users' positive emotions by Co-design not by accident, and durable not for short-impact?

- How can the positive response from the pleasant surprise at the user's first contact with the product be extended into pleasure throughout their post purchase experience?

- How can the user's negative emotions be accommodated after purchase to maintain a stable emotional, positive long-term experience, without boredom, and with a higher level of an emotional satisfaction?

Moreover, there are more questions which relate to the main focus of this research such as:

- How can unpleasant surprises be avoided at the first user-product contact time?

- How will users respond emotionally to products as objects and artifacts when they are involved in the design process and evaluation?

- Which methods, tools, insights, and strategies can be developed and used to deeper understanding the users' emotions and the design effect on these emotions?

- How negative emotions such as boredom impact the user-product relation?

1.7. Research Hypotheses

The main hypotheses of this research were constructed as follows:

- Design process development can be based on addressing and dealing with perception on three levels; on the user's involvement and evaluation, the follow-up after purchase, and design re-configuration during the user's experience with products, which will result in an emotional design and ensure the user's positive first impression and positive experience, and will delay new product purchases, and gain the user's loyalty.

- Products that are upgradeable during their lifetimes will help users to recover their positive feelings, inhibit/accommodate any negative emotions related to the product, such as boredom, extend the duration of the user's attraction to their product, and support mutual designer-user trust. This aesthetic and emotional upgrade could consequently lead to better product experience with a higher level of satisfaction.

1.8. Research Targets

This research is an attempt to explore the mechanism of how products influence users emotionally from the very beginning of user-product interaction at the pre-possession stage and throughout long-term usage; accordingly this research aims at structuring an outline of emotional design process development relied on perception three hierarchical levels. This developed designing method intended to surprise users pleasantly, to ensure their positive first impression, to enable them to recover their positive emotion on the long-run of product experiencing. Aesthetically and emotionally dynamic design concept will be created to

provide users renewable and enjoyable experience; which in turn, will help them to overcome boredom and offer them higher level of satisfaction as well.

1.9.   Review of Related Literature

In the design profession some visionary books were published expressing an increasing awareness of the importance of user emotions, especially those related to the technological devices that stimulate frustration by the user because of their poor interface design. There has been significant progress in the "Design and Emotion" field in the last few years which can be categorized as follows:

1.9.1.   The Scientific Field

Classical treatments of this field often focus on behavior or cognitive approaches that downplay (or outright ignore) the impact of emotions on the design process and on user experience in the long run. Approaches concerned with the input-output (stimulus-response) paradigms of the human mind assume that emotions accommodate every aspect of human existence (Aumer-Ryan, 2005). Many conferences have begun to be held, such as the annual Design & Emotion conference which has been held regularly every two years since 1999, where research has been presented to review new progress in that field. The emotion was in the spirit of the times at the turn of the millennium, as many authors - such as Pine and Gilmore "The Experience Economy" and Jensen "The Dream Society" - who explored an interest in emotion as well as users' emotional responses.

The first book predicted the development of experience-based economy, as well as it has predicted the increasing of the human emotions' commercialization (Pine, 1993). Whereas the Jensen's book stressed that, in order to become or remain successful, businesses should learn to stage rich and compelling experiences, and consumers would shift from buying products to the experiences and emotions conveyed by products (Jensen, 1999). In line with this vision, Schmitt (Schmitt, 1999) introduced the concept of transforming the then-popular features-and-benefits approach into one that focused on sensory responses and emotions. He emphasized that emotions are key to developing new products, and communicating with customers (Desmet, 2009).

Likewise, Jordan in his book "Designing Pleasurable Products" emphasized the need to living objects that offers something extra and people can relate to rather merely tools, products that brings emotional benefits in addition to functionality and usability ones (Jordan, 2003). Patrick Jordan also focused on the need for saving time in the emotional design

process by developing methods and metrics for assessing product (design) pleasurability. It is hoped, according to Jordan, understanding what must be taken into account in order to design products that will be pleasurable for those who own and use them. His explanations were limited and even dehumanizing because they only focused on a person's physical and cognitive abilities. Jordan proposed, alternatively, a pleasure-based approach to human factors that addresses the relationship between people and products holistically, judges the quality of designs on the basis of the wider relationships between products and the people for whom they are designed (Desmet, 2009). Jordan gathered information about specific users, analyzed and organized this information into categories, and then tried to apply the results on existing products to fulfill one or more of these requirements and abilities. Donald Norman (Norman, 2002, 2004), one of the most known authors on the topic of emotions, divided the process of design perception into three hierarchical levels in his book "Emotional Design: Why we love (or hate) Everyday Things". These levels are interdependent; the second level occurs according to the first one, just as the second shapes the third.

Also, Jonathan Chapman (Chapman, 2005) in his book "Emotionally Durable Products" examined the emergence of a specialist design that fulfills deeper, more profound and emotional needs of human, taking users toward a rich, interactive domain of emotionally durable objects and experiences. There are also many other authors, researchers, and scientists who have written about and discussed design and emotions. The bestseller status of these books demonstrates the initiation of a profound interest in the emotional aspects of designing, buying, and using products, and nobody would argue against the idea that usage experience should be pleasurable (Desmet, 2009). But more knowledge was required for supporting the efforts to consider the experiential impact of designs. And then, the progress in this filed was driven, however, by the intention to support and empower designers according to Green's words in the 1st International Conference on Design and Emotion:

"Our objective is not to provide recipes for non-designers to become designers, but to provide tools for the design profession to do what they do better" (Green, 1999), and that matches the goal of this dissertation. This objective is to express how to develop tools, methods, or insights that would help designers to 'design better' by understanding and dealing with the effects of design on the emotions of the user especially during the experience with the products.

1.9.2. Emotional Products

A number of examples describe pleasurable, un-pleasurable, or emotional products, these

emotional products have been introduced by providing or failing to provide particular benefits which fall into one of two possible groups (Jordan, 2003):

- They are the result of conscious design decisions aimed at providing particular benefits to evoke some pleasure in the experience of the product.
- They may have carried special benefits as a result of "happy accidents" specific to the historical and social context in which the product was introduced.

At the same time, several workshops are striving to develop and understand emotional design in more and deeper dimensions. A lot of brands have been produced to raise emotional responses, while others were produced to contain an emotional aspect. Some of these attempts were:

- A website's emotional design created to determine an accurate and exhaustive set of users' needs. This website meets user's expectations, provides useful and enjoyable content, and achieves the maximum interaction with users. This was achieved through websites with an emotional design and emotional content (Capota, 2007).
- While some of the most well-known automobile manufacturers were working on the emotional design concept, they produced new models based on an emotional interaction between users and products. For example, the New York Times observed that the "Mini Cooper" car has dynamic attributes, it has provoked more smiles, and it is so much fun to look at and drive (Norman, 2004). Recently, there was a POD "Personalization on Demand" aspect related to another model from Toyota, which was developed to explore and strengthen the bond between car (Product) and driver (User) through a give-and-take relationship. Furthermore, BMW, one of the most celebrated car companies, designed an emotional car – called Gina- that interacts with its users emotions.
- In the field of mobile phones, a project has been created by Desmet and van Dijk (Desmet, 2007) to explore new aspects of emotional design (Mobile phone), and to demonstrate how the way to achieve a "wow-experience" can be conceptualized. Also, mobile devices now offer their users the option to change appearance or content by offering many alternatives such as themes, software updates/upgrades, and device covers. In the field of furniture design, one study (Carbonell, 2008) linked to emotional furniture design found that some furniture products were designed according to the emotion-perception relationship; these products explored themes of public and private behavior. They intended to provide users with an escape from everyday life, but this kind of furniture lacked practicality, and proved unable to give

users long-term satisfaction. Critical studies showed that difficulties using this kind of furniture stemmed from overemphasis on the designer's feelings without considering the user's needs. They have been described as fantasy furniture, and couldn't emotionally satisfy users. The range of emotions offered by most electronic products (furniture not included) is pathetically narrow (Chapman, 2005).

As a result, this puts a priority on non-electronic products such as furniture to be designed to offer users a wider range of interaction and emotional accommodators. The need to accommodate users' emotional changes may arise for many reasons, such as a positive emotion shifting into negative one, or because of everyday psychological changes, or even because of a users' stylistic change in the interior design of the place where furniture is being used. Also, emotional responses related to attitudes are elicited by the appearance of the 'object' and not by an (anticipated) consequence of usage or by (expected) behavior or functioning (Desmet, 2007), in spite of furniture usage depends mostly on functionality. This illustrates the importance of designing for emotion, a positive first impression explored because of appearance, and longevity. Moreover, the long-term usage of furniture, as a non-electronic product, necessitates developing a furniture design process that can create interactive furniture products for a positive and enjoyable experience in the long run.

1.9.3. Measuring Tools of Emotional Responses

The significance of user emotions and experiences in the design domain has led to the introduction of various tools and techniques aimed at gathering information about users' emotional interaction with products and thus shaping the products in the light of this information. These tools can be grouped into two:

" 1) tools and techniques used to gather information and knowledge about users' emotional experiences; and 2) Tools used to measure the affective influence of products" (Demir, 2008). However, there are specific ways of measuring emotions which categorize emotional measurement in four areas as follows:

- Self-report, which measures experience.
- Observation, used for measuring expressions.
- Performance tasks, to observe behavior and cognition.
- Physiological measurements, for psychological aspects.

These four areas have been used to create and develop some tools of measuring emotions; these tools include Kansei, PrEmo, LEM Tool, CapturEmo, etc. They have been used for

measuring the users' emotional responses to the different products through facial expressions using cartoon characters.

- **Kansei Engineering Measurement:** First developed in Japan to design feelings into products. Kansei [1] is used to express the quality of an object for producing pleasure through its usage, taking into account subjective factors (emotions, affect, perception, sensation, etc.). Kansei can measure feelings and shows the relationship to certain properties of a product. The process of Kansei starts with a set of products sufficiently diverse to provoke a wide range of different emotional responses (Chen, 2008). These subjective responses can be assessed by using sets of unipolar scale which prompts a respondent to think of the presence or absence of a quality on a 0 to 1 scale, while a bipolar scale has two polar opposites that prompts a respondent to balance between the opposites on a scale of -3,-2,-1, 0, 1, 2, 3.

- **PrEmo Measurement:** Desmet used cartoon animations in measuring emotions (Fig. 1-3). Desmet's model, called PrEmo "The Product Emotion Measurement Instrument" is a nonverbal, self-report instrument which measures 14 emotions that are often elicited by product design. Instead of relying on the use of words, respondents in PrEmo reported their emotions through the use of a set of 'cartoon' animations (Güngör, 2007).
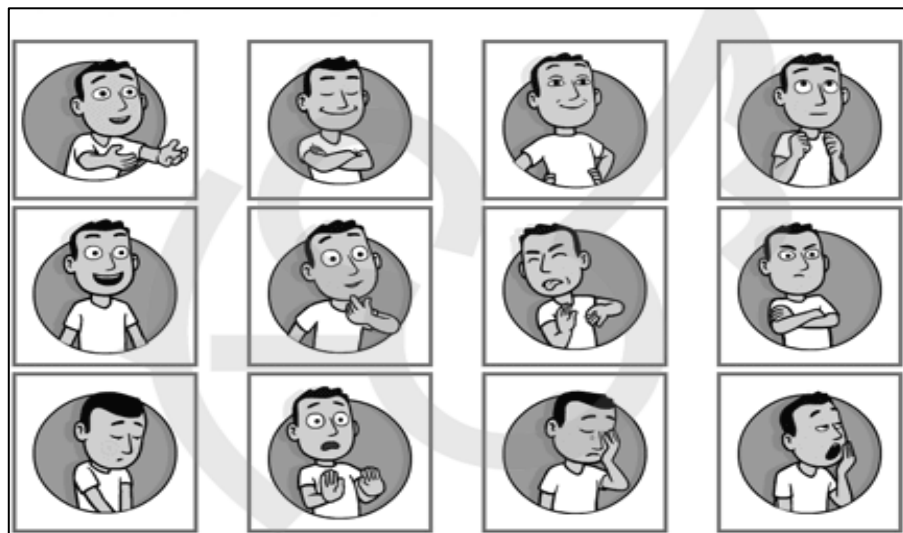
Fig. 1-3: PrEmo tool measures and expresses emotional responses through facial expressions

- **CaptureEmo Measurement:** CapturEmo (Fig. 1-4) is a real life emotional experience sampling. CapturEmo is a tool that allows using basic experience sampling extended with validated emotional characters, like all the other tools. This method assumes that

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[1]) "Kan" means sensitivity, and "sei" means sensibility. Together, they address the psychological feeling or image of a product (Lokman, 2010).

capturing people's emotions in their natural habitat and daily environment is the key to really understanding their personal drivers, behavior, and experiences (SusaGroup, 2007-2012). But, how does it work? Using CapturEmo is really intuitive, it can be used by:

✓ Capturing anything (by photo / sound / movie).

✓ Assigning a specific emotion to it.

Fig. 1-4: The CapturEmo measures emotional responses by capturing an image, sound or movie

LEMtool Measurement: The LEMtool (Fig. 1-5) or "Layered Emotion Measurement tool" has been developed to measure emotions in a non-verbal way especially in interactive mediated contexts like the web, media and advertisements (Huisman, 2008). The LEMtool captures the emotional experience of a person during interaction with a website or an interactive product using a set of cartoon expressions.
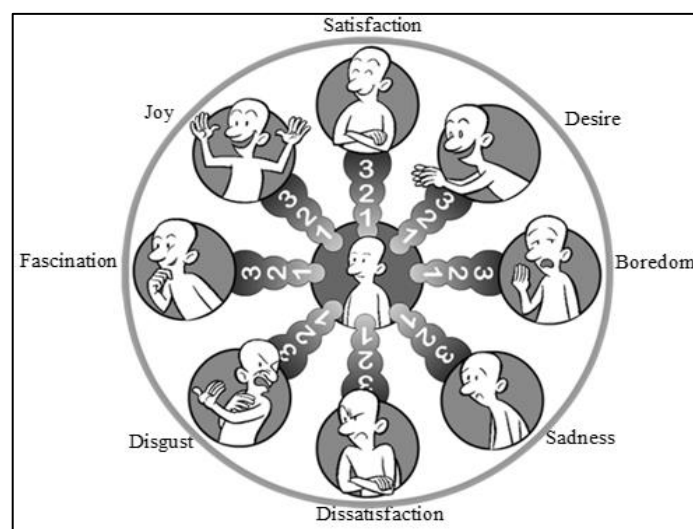
Fig. 1-5: The LEMtool expressive cartoon characters

1.10.   Research Main Focus

This research focuses on the field of emotions, design, and other relevant disciplines to develop a design process, and while much scholarship on this topic already exists, much is still underway. This development is represented by a specific strategy and uses certain tools to create an emotional design and positive experience. Furthermore, this research will focus mainly on three disciplines which interweave to constitute the design process development:

- **Theories of Emotions:** They consider and explain emotions, and will be briefly mentioned. Whereas basic emotional theory and its divisions, especially Plutchik's emotional wheel, as well as aspects of emotions will be taken into consideration to identify the negative emotions to be inhibited or accommodated, and the positive emotions to be stimulated.

- **Psychology and Perception:** Emotional responses are linked to psychology, perception, and cognition. Cognition is the acquisition, storage, transformation, and use of knowledge (Matlin, 2005), while perception, is a deeper mental process included in cognition that guides our decisions and actions and shapes our beliefs (Tacca, 2011). This research will focus on the three levels of perception as outlined by Donald Norman (Norman, 2004), and the how to design taking these levels into consideration in order to evoke a user's positive first impression with pleasant surprise, and ensure them lasting positive experience.

- **Design Process and Application:** Design process development, co-design, and mass customization are the research techniques and tools that will be applied from an emotional perspective. The practical application will be a "Coffee table" design concept which has been chosen to demonstrate these methods and strategies. At the same time, the theoretical framework discussed in this research can be of value for designers because it can facilitate the designers' structured attempts to "design for positive experience". This framework attempts to influence the experiential impact of new designs to pleasantly surprise users at purchase, to stimulate their positive emotions and inhibit and/or accommodate their negative one, to extend their pleasure during the experience with products, it is about users' emotional satisfaction.

  This research demonstrates that different design emotional contents -positive or negative- lead to different types of both positive and negative experiences. It makes a case for strategic approach to designing products that evoke desirable positive emotions and minimize negative emotions, by inhibiting or accommodating negative

one, to enhance customer loyalty. Insights gained in this study can support emotional design as they contribute to providing a structure for emotional design process.

Emotional design can be formulated providing a stronger and longer positive user-product relation. This can be accomplished by using co-design approach and re-configuration features to activate or to prevent the intended positive or negative emotions. One of the main aims of this method is to add effective emotional utility to the product by designing it with an emotionally and aesthetically upgradeable appearance. This may provide valuable insight for the improvement of product design and emotional design strategies, as well as for user-product communication (Envick, 2008). This is on one hand; on the other hand, these insights will represent an objective tool for exploring the dynamic relation of user's emotional state during user-product interaction. This emotional design model can add depth to our understanding of the nature and quality of user experience and provide useful visual and statistical data for designers about the way the user may experience negative emotions.

The critical overview of some design-based application such as mass customization and being used after the design is already turned into product would be of interest to designers adopting a user-centered approach, as it could guide their efforts to better understand users' experience with products and their emotional needs, and deliver products which are of emotional value to them.

1.11. Thesis Structure

The main focus of this research required particular structure of this dissertation to consist of two volumes and arranged as follows (Fig. 1-6):

-First, **Volume I** consists of seven chapters that contain the scientific materials, theoretical data, literature review, and background about relevant approaches to the subject matter of the thesis. The main body of this research is:

- **Chapter 1:** It offers general insight and introduces the thesis attitude, abstract theme, research focus, and provides background and information about the concept of emotional design. It also covers theoretical background and contains a literature review of publications about emotion and other approaches relevant to this study. This chapter states the major problem of this research, and presents the main questions that this research intends to answer. Finally, it touches briefly on related previous work and tools for measuring of emotional responses.

- **Chapter 2** lays the foundation for the overall structure of theories of emotions and perception. The main sections of chapter 2 discuss emotions and design in general,

some findings about the emotion-perception relation, and the main components of emotions. These components explain how emotions control the process of feeling products. Also, this chapter focuses on the understanding of perception to describe how users perceive products and how to make them perceive these products positively.

- **Chapter 3** is the third part of the theoretical literature review. It focuses on three main points relevant to the aesthetic and psychological impact of the elements of design from an emotional perspective. These three points structure the aesthetic features of the design individually, and together. They also establish the way to co-design, incorporating designer emotions without contradicting the users' emotional needs, and how to involve users in the design process to customize according to their emotional needs within the limits of the designer's expertise in the field of creation.

- **Chapter 4** completes the theoretical background. It introduces the suggested strategy to move users from having their products designed *for* them to being designed *with* them. This chapter also focuses on a technique -mass customization- that can be used within the design process to meet users' needs and translate their expectations into reality. Furthermore, chapter 4 discusses the way to connect users to their products emotionally on two levels: 1) The first level is to include emotional lifetime extension into product design, and the second level is 2) to give users a chance to recover the positive emotions that controlled their purchase process, or accommodating the negative emotions provoked because of the products, by upgrading these products aesthetically and thereby emotionally. Moreover, this chapter focuses on purchase process and the emotional motivations related to purchasing or experiencing products- especially the negative emotions stimulated during this experience. This chapter focuses on how to strengthen the mutual trust in the designer-user relation based on trusting the product itself,   and creating common responsibility aiming for the product's success.

- **Chapter 5** outlines the experimental approach and the applied strategy for putting theoretical data related to the field of emotions and perception into practice. Users, in this strategy, are considered as informants, co-designers, and evaluators. This strategy consists of a particular sequence, has specific tools, target users, and stimuli. This developed design process outline focuses on three levels relevant to user-product relation. This relation consists of three phases, two of them within the design process, and the third in the post purchase phase and experience time where emotional relation

is limited to the user and product. Furniture has been chosen to apply this strategy; a survey and mass customization application have been selected as tools.

- **Chapter 6** discusses and concludes the research, suggested solutions, makes observations, evaluates, and validates the results.
- **Chapter 7** provides a summary of the main key findings with description and analysis, and concludes with suggestions for further research.
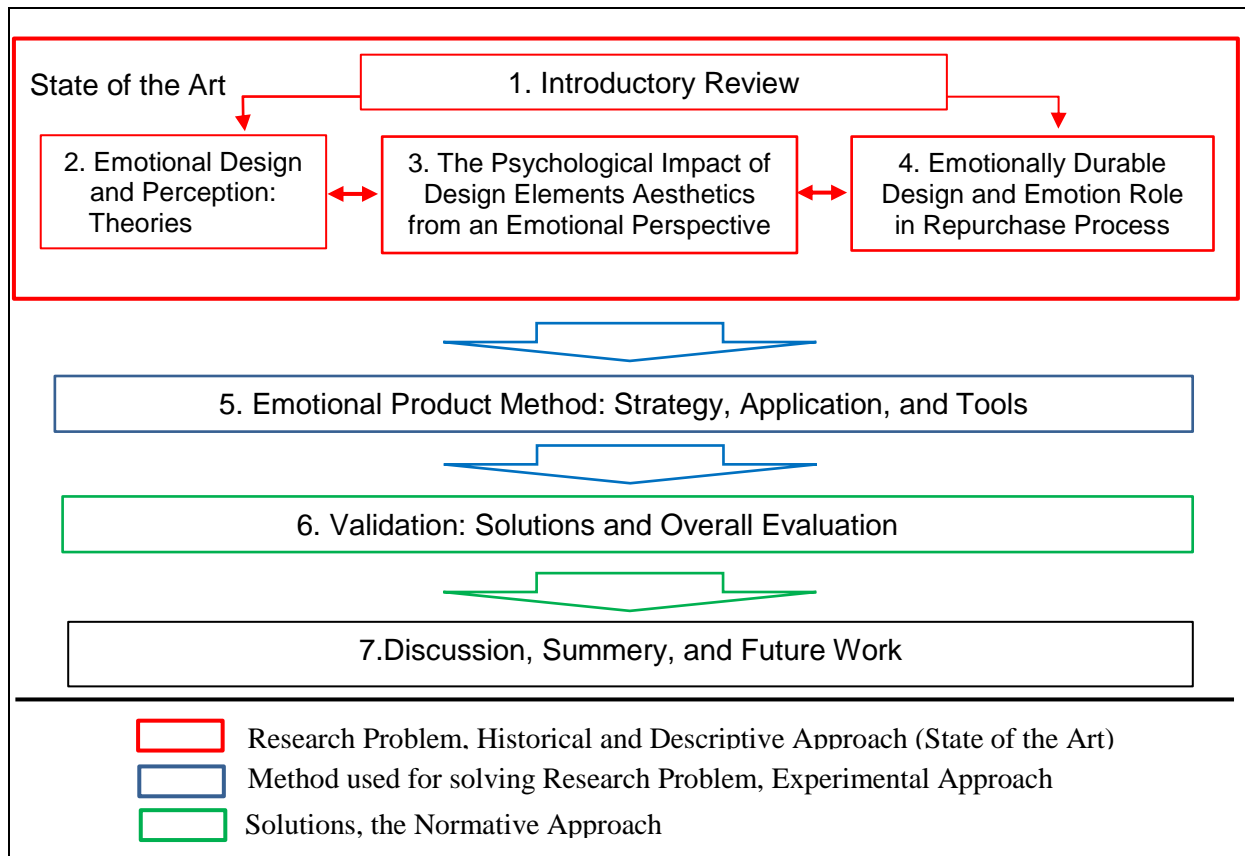
Fig. 1-6: The Relation between the Thesis Chapters, Approaches, and Sequence

- Second, **Volume II** includes the appendices which consist of the tools that have been used in collecting data such as surveys.

1.12. Research Methodology

Methods and procedures to gather information and data are needed in order to understand the emotional user-product relation. This research process consists of:

- **The Historical Overview:** This phase of the research process will focus on the first part of the dissertation in the form of learning and understanding the background and growth of the field of emotional design and perception. Fact-finding enquiries about the emotional design and perception are aimed. The gathering of as much relevant information about the emotional design elements as possible will be

considered, this, to describe the state of them as they exist now. The selection, organization, and analysis, and detection for this information to make a critical evaluation of the advantages and disadvantages of what have been achieved and what will be required to be achieved. That will be as follow:

This literature study focuses on <u>Chapter 1</u>: **Introductory Review** & <u>Chapter 2</u>: **Emotional Design and Perception: Theories,** to fulfill the following fields such as emotional design (concepts, definitions, characteristics, and most relevant theories). These data will be gathered from the different references, publications, and Websites. The previous studies and attempts of creating emotional design, and the methodologies used to create these products will be considered. Also, this part of literature will focus on perception and how user perceives individual elements of the product or in the final form, to determine the way perception can be controlled and positively directed.

- **The Descriptive Approach:** It is another part of the literature, and it will be used to obtain a general overview of the interdependence relations among several variables such as perceiving design as individual elements and as a final design form, according to these elements' emotional effect on users. That will be, by involving them in a co-design process, to determine the effective way to use this process in exploring users' emotional needs. Then, organizing, analyzing, and detecting this information from the emotional perspective in order to establish for the design elements' emotional effect; how it was, and how positive should it be? Therefore, this process focuses on <u>Chapter 3</u>: **The Psychological Impact of Design Elements: Aesthetics from an Emotional Perspective** to fulfill some related disciplines such as the psychological effect of design different elements, and which of these elements impact the user more effectively and positively especially those related to design appearance. Moreover, this approach will focus on other relevant disciplines to the field of product design process, such as co-design process, and mass-customization. That, in order to specify the use of these disciplines in developing design process, and creating an emotional design.

- **The Descriptive Approach:** It will be used again in <u>Chapter 4</u>: **Emotionally Durable Design and Emotion's Role in the Repurchase Process,** to keep collecting data in order to answer the question and explain how the way to turn the theoretical current status of the emotional design features into a real emotional product. This translation will be by designing for longevity with positivity through

targeting a specific positive emotion to be evoked and avoiding another negative one. Therefore, this process represents an attempt to fulfill some fields related to concepts such as design for product lifetime and upgradable products to determine through them, the way to keep on user positively connected to the product with pleasure and as long as possible. Then, focusing on a specific positive emotion such as pleasant surprise, pleasure, and trust and how to evoke them, and another negative emotion such as boredom, and the way to overcome it especially during product experience, and those emotions' role in repurchasing process.

- **Experimental Approach:** This approach is used to explore and determine users' (research target group) expectations, desires, and opinion into a real emotional design, then meeting their desires and fulfilling their emotional requirements in the second phase of co-design session to translate them into a real emotional design. Therefore, the experimental approach focuses on <u>Chapter 5</u>: **The Developed Method of an Emotional Product: Strategy, Application, and Tools**, using surveys (mailed questionnaires) in collecting data to achieve particular targets such as exploring relationships between the three research variables; user involvement, first positive impression, and getting bored during product experiencing. This approach also aims at obtaining clues in identifying needed changes before and after the co-creation sessions and design components, with the involvement of users in the design process. And finally, it targets revealing statistical summary about the different responses to all possible questionnaire items that related to the emotional design, the design process phases, the difference between tested design as individual elements and final product, the user behavior during product experience, and finally, the reasons of getting bored and the way to overcome boredom. This survey has some utilities that have been attached to increase its targeted efficiency such as a visual prototype which is an on-screen video (Jordan, 2003), and an illustrative tool which is a mass-customization application based on computer-aided design.

- **The Normative Approach:** Normative approach focuses on <u>Chapter 6</u>: **Validation: Solutions and Overall Evaluation,** and it aims at finding out not only how the emotional product features should be, but also to specify the outline of the developed design process and validate its efficiency in creating and emotional design.

1.13. The User as Designer's Partner

The conventional discipline of participatory design focuses on users' involvement as informants to be used as a design development base; whereas with co-design, users may be involved as design partners in the form of interactive co-designers (Sanders, 2002). In the field of emotional design, the main focus of this research, users are effective and actual co-designers, informants, and evaluators from the very beginning of the design process until the advanced phase, and then as evaluators of the design even during the experience with it.

In other words, users are engaged in the entire design process with multiple roles to play, and afterwards, they will obtain the final outcome resulted from their participation and co-design process to evaluate it and re-design it during their experience time. This outcome, according to the research goal, is represented by a new emotional product that contains a balance between the designer's emotions and the user's emotional needs. Users will be able to follow-up on all phases of the progress with the design that has been co-created with them. During the experience with the product, users' emotions will be followed up upon, and their problems with it will be taken into the designer's consideration to identify and dominate the emotional changes that take place because of the product. This feedback can reveal the reasons behind the changes that are relevant to product features, and take them into account in the next development process of the same product. In all these sequential roles, the user will be an effective component of the product design or development.

1.14. Research Targeted Audience

There are many types of specialists who are focusing on design. However, they should also put more energy and focus on the way in which emotions can and do influence users' interactions with designed objects, especially in the phase of experiencing these objects. In other words, the field of design includes many professionals, such as designers, programmers, engineers, inventors and creators, and finally producers. But, who will be affected by these designs? The answer is more than simple; these designs will affect *everyone,* including users, who will be even more influenced.

Users became a central part of the design development process because users' involvement leads to more effective, efficient, and safer products that have been designed to enhance their acceptance and success (Abras, 2004). To achieve a deeper understanding of users' requirements, it is important to define three user categories. These represent the most common components in society with various categories (Fig. 1-7), and these are (Eason, 1987):

- **Primary Users:** Those persons who actually use the object;

- **Secondary Users:** Those who will occasionally use the object or those who use it through an intermediary, and;
- **Tertiary Users:** The persons who will be affected by the use of the object or make decisions about its purchase.

The effect of products on all user categories must be carefully considered for these categories to be represented in a design process (Preece, 2007). At the same time, the starting point for product enjoyment and human factors approaches is a complete and deep understanding of the target audience for whom these products are to be designed (Sanders, 2002).
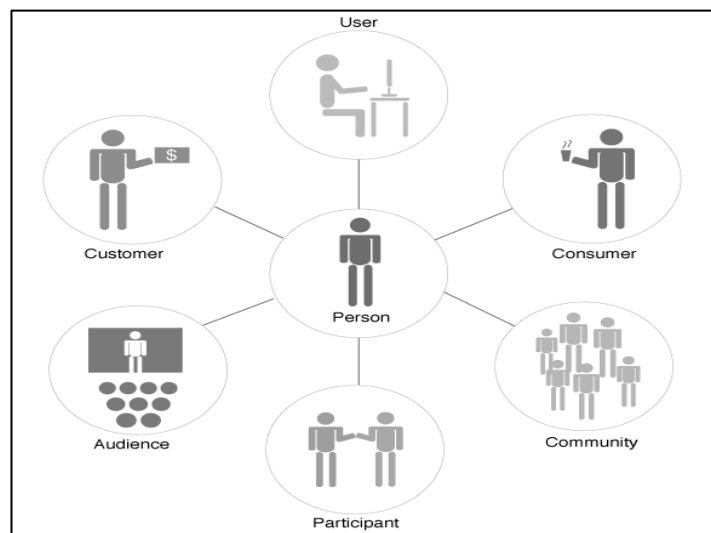
Fig. 1-7: User as a major society categories' component with different labels

It is important to take a wide range of product users into account; therefore, the target category here is **the primary users** who will be affected directly by the interaction with products, as well as designers with small business who needs guidelines for an outlined emotional design process and design strategy which result in a higher level of user emotional satisfaction.

This chapter covers one of three main axes of the state of the art related to the research topic in order to illustrate the main strategy used to create an emotional product. This chapter includes a review of works related to the field of design and emotion from the psychological perspective.

It focuses on concepts of emotion (definitions, divisions, importance of emotions, and the relation of emotion to various aspects of design).

This chapter looks at components of emotions, briefly discussing the most known theories of emotions, especially Plutchik's wheel of emotions. This theory has been used in outlining a strategy that is intended to result in an emotional product that evokes positive emotions and inhibits negative ones.

Likewise, this chapter focuses on other relevant concepts like perception and the definition thereof, the three main levels of product perception, and how to positively orient user perception.

Chapter 2

Emotional Design & Perception: Theories

2.1. Emotion & Design

All products have an effect on users' emotions and experience, whether that effect is positive or negative. In other words, all authors who have written in the field of design and emotion have shared the realization that all products affect the emotions of users as neutral products do not exist (Desmet, 2009). Therefore, designers should consider understanding their design's effect on users' emotions in order to achieve important goals. These goals relate to designer success as well as user emotional satisfaction. Some of these goals should be aiming for the user's positive emotional responses and increasing the product's emotional effect, and thereby guaranteeing user loyalty. These goals can be pursued by decreasing the negative emotional impacts that may be raised during experience of the product throughout its lifetime, and following up on users' emotions and relationships with products after these products have been purchased to keep users emotionally connected to them and to make this connection positive, renewable, and coherent.

Accordingly, many initiatives studying the field of emotion have been conducted not only because of the need to understand the user-product relation (Norman, 2002) from the complicated emotional perspective, but also to improve designs and the designing process. This also serves to shape users behavioral and psychological equilibrium states by accommodating their emotional changes after these products were purchased. It is important to construct an outline of a design process based on in-depth psychological understanding of emotions and how they influence users' behavior. The view of emotions outlined by the literature here will focus on the most popular concepts, aspects, and definitions of emotion, divisions, theories, and other relevant fields such as perception, as well.

2.2. Emotion: Definitions, Divisions, and Aspects

Emotion is a mental and physiological state associated with a wide variety of feelings, thoughts, and behavior (Consoli, 2010). Many authors have tried to define emotion with over ninety different definitions which have been widely accepted and have illustrated the elusive nature of emotions (Güngör, 2007). These authors described emotion, the way emotions affect people, how they feel, how they behave, and how they think; showing emotion to be a necessary part of life (Norman, 2004). Designers face the challenge of evoking emotions and experiences in the prospective users of their products (McDonagh, 2004), which emphasizes the importance of understanding emotion to orient the user's experience towards positivity. However, many authors have created categories for emotions to make better sense of the different emotional states, and these have been divided temporally as well as cognitively

(Aumer-Ryan, 2005). These three temporal groups of emotions are the key to understanding user experience and product perception; accordingly, they are important and required to direct this perception positively to result in the desired responses. These three categories, associated with Donald Norman's three levels of perception, they are as follows;

- **Affect:** a changeable and insatiable state, mainly reflected in facial responses, first impressions, and feedback (Strongman, 2003). Norman described it as visceral level where fast reactions take place and rapid judgment is made (Norman, 2004).

- **Emotion:** is less situational than affect, and tends to be based more on causality (Aumer-Ryan, 2005). Norman labels it as a behavioral level which controls everyday behavior, coincides with bodily activity, and includes feelings like frustration (Norman, 2004).

- **Sentiment:** is the longest lasting emotional state, and tends to include memories and feelings such as love and hate (Van Gorp, 2010, Turner, 2007). Donald Norman called this category *reflective,* where actions can be enhanced or inhibited (Norman, 2004).

Moreover, there are some known aspects related to the field of emotion and design, as the difference between "Emotional design", "Emotion design", and "Emotionalized design" may need to be clarified, since designers will identify this difference as the way to target the user's emotions to satisfy and fulfill their emotional needs. Amic (Amic, 2008) introduced these three aspects based on the role of designer and user emotion. Some researchers considered "Emotion design" as a tool that designers can use to deliver their messages and emotions, while others believe that it is a kind of experience and a response when an individual is using an object. Some researchers have regarded "Emotional design" as a means to establish consumer expression, and as a representation of the users' identity or personality. The relationships between "Design and Emotion" and "users' responses" were preliminarily explored. Another similar term, "Emotionalized design" has been used to explain how emotions play an explicit role in design reflection, rationality, and feeling.

These are the most common divisions that classify different aspects of emotions. Designers should add their own insight to these divisions to map them to different characteristics of products if these products have been created to address users' emotions. Designers should develop their own knowledge and present emotional influences to control users' experience throughout these three levels of user-product relation, since designing for each level requires different tactics (Aumer-Ryan, 2005). Although this division of emotions is well known, there

is another categorization that relies on the way emotion affects the design process, since the design process is based on usability as well as emotions.

2.3. Importance of Emotions

When proceeding to the design for emotions, several issues come into play; e.g. emotion, appraisal, concerns, perceived meaning of the product, and the product's objective properties (Ornäs, 2007). These issues are important for any designer to consider in order to access the user's positive emotions and responses accurately and effectively. At the same time, design is the basis for almost everything, from what we sit on to what we drive to, as well as being about how we react visually to everyday objects (Norman, 2002). According to Donald Norman, a transition from addressing only utility and usability, function and form, to including emotions should take place (Norman, 2004). Sure, utility and usability are important, but without fun and pleasure, or other emotions, our experience with products will not be perfect. To gain a deeper understanding of the basic nature of emotion, the next few sections will clarify the importance of emotions in several fields such as:

2.3.1. In Life and Survival

Emotions are conscious feelings about one's self and objects in one's environment (Turner, 2007). Our emotions have been developed by the nature over a long time, and they have the potential to serve us today as a sensitive and advanced internal guidance system (Goleman, 1995). Darwin, in his evolutionary perspective, was the first to suggest the functionality of emotions in survival (Darwin, 1872). Emotional intelligence alerts us when a natural human need is not being met; emotions guide our thinking, values, and survival as well (Algibaly, 2000). Sometimes we have a negative feeling such as being lonely which means that our need for connection has not been met or fulfilled (Arion, 2012). Emotionally designed objects and experiences provide a tangible means for us to engage with the world on this existential level (Chapman, 2005).

2.3.2. In Design

Emotions are memory-based, last longer, and have easily conveyed meanings (Aumer-Ryan, 2005). Moreover, emotions play a critical role in users' judgmental systems, since visual aesthetics is traditionally the field in product design that deals with pleasant or unpleasant emotion. Design features such as color, shape, and form each have their own effect on our

visual experience. These properties can interact and counteract to raise all kinds of feelings (McDonagh, 2004).

Typically, the more emotional something-whatever it might be- is for us, the more memorable it will be. If an event, product design, or even a situation in our lives causes us to feel an extreme emotion, we will be more likely to remember it, as we learn from our emotional memories (Aaker, 2008).

Authors who discussed the issue of "Emotion" were implicitly or explicitly driven to comprehend the effect of design on users' emotions by one of two reasons; the first was that being unaware of these effects can create unexpected and undesirable user reactions (Desmet, 2009). This, in turn, confirms the importance awareness of user's emotions to be considered in design otherwise, the design may not be accepted from users who place the fulfillment of their emotional needs at the top of their list of priorities. Donald Norman argues that the emotional side of design may be more critical to a product's success than its practical elements (Norman, 2004). This means that understanding how to avoid negative emotional responses and increase positive ones has revolutionary implications for design success.

2.3.3. Emotion vs. Logic

There is a wide range of decision-making that uses emotion according to the degree of logic included in the process, and this process accrues very fast, as it takes a very short time (Damasio, 2002). Common emotional decisions may use some logic, but the main driving force is emotion, since decision making which has no place for emotion is pitifully incomplete (Norman, 2004). Another common use of emotion in decision making is to start with logic and then to use emotion in the final choice (Damasio, 2002). Decision-making is a cognitive process where the outcome is a choice between alternatives; therefore, the emotional product designer should ensure that these alternatives fall within the bounds of users' desires.

We often have different preferences as to our preferred approach, varying between thinking and feeling (Bermudez, 2003); we do not have to choose between our feelings and thoughts, as emotional awareness functions like instinct. When our emotional awareness is strongly developed, we'll know what we are feeling without having to think about it. Emotional awareness depends on our emotional signal strength, and when it is strong enough, we will recognize when something important is taking place and we will consequently shift our focus accordingly and ignore our logical thinking (Segal & Robinson, 2010).

2.3.4. In Decision Making

We still make logical decisions when we are presented with a problem, even though our emotions may be telling us something else (Norman, 2004); this sometimes leads to confusion. Affect and cognition are information-processing systems, but they have dissimilar functions:

- The affective system: makes judgments and quickly helps us to determine which things in the environment are dangerous or safe, good or bad (Norman, 2004).
- The cognitive system: interprets and makes sense of the world. Affect is the general term for the judgmental conscious or subconscious system.

While affect is unconscious, emotion is the conscious experience of affect (Eysenck, 2000), which gives emotions a high level of importance when one intends to design an emotional product. Furthermore, affect and emotion are crucial for everyday decision making, which means communicating with users' emotion is a means to communicate to their everyday life (Bourion, 2005). Emotions are a valuable source of information. If our emotional memory of a design or product is strongly positive or negative, it may cause us to have an overall positive or negative association and may be the reason for us deciding not to purchase that product next time (Darling-Hammond, 2009). Some of these decisions could be irrational, as with an emotion from one negative experience such as being wounded by a table's sharp edge, which will then be attached to all tables, including those with rounded edges.

2.3.5. Emotions as Universal Language

All human beings share the same emotional language, because emotions are a universal language as well (Wierzbicka, 1986). Facial expressions or emotions are described the same by respondents in all countries. Anywhere you travel, people can connect with, and understand us, on an emotional level. However, there is a need to understand what stimulates specific emotions, to communicate these universal emotions through design, to know and explain the universal nature of emotion through design, and to understand the common conditions that occur in each emotion-producing situation related to the design, at any time, in any place, and for any person (Thamm, 2004). These few sentences should lead the designer to understand whether they are creating for or against individual and special users' emotions, and to remember to share these universal emotional requirements with others. This could be achieved through designs which address users' emotions directly. Designing for emotion is a design for universal communication which leads to more social understanding among people and more satisfaction with products. Furthermore, emotions are "the glue" that connects

people to one another (Segal & Robinson, 2010). This definition refers to a broader spectrum of imagination which produces all kinds of usable and effective products and/or environments for everyone.

This means that seeing design as a message with emotional content to be sent from the designer to the user should be labeled as a very important communication tool that designers can exploit and use to appeal to a wide range of users. Attaching emotional features to any design will increase the range of making it not only a means of user-to-design communication, but also user-to-user communication, and this design will trigger positive emotions in users experience as another deeper advantage (Demirbilek, 2003). We also prefer the concept of emotional production that allows us to refine the underlying process of communication (Bourion, 2005); this communication through emotional design could be seen as nonverbal, but very expressive communication. It delivers the story and feelings that motivated and formed the designer's thoughts throughout the entire design process. It should express and explore both designer and user emotions without any words; consequently, designing for emotional impact is an effective, strong, and clear means of communication between the designer and user.

2.3.6. Emotions and Unity

The effective domain that relates to emotional unity depends on emotional quality. Each emotion-type essentially possesses a certain hedonic quality, whether it is negative, positive, or mixed (Goleman, 1995). Our emotions are perhaps the greatest potential source of uniting all members of human kind; it is clear that our various religions, cultural, and political beliefs have not united us (Hein, 2011). Emotions, on the other hand, are universal, as empathy, compassion, cooperation, and forgiveness, for instance, all have the potential to unite us as a species. Although when an individual person is being asked to describe an emotional state or response (affect) for a particular situation, she/he uses a non-reflective feeling description with the same specific words to answer, as these words illustrate emotional unity and universality (Parker, 2007). Generally speaking, beliefs divide us, whereas emotions unite us (Arion, 2012).

2.3.7. Emotions and Behavior

One way to better understand the real effect that emotions have on our behavior is to understand what else may influence that behavior as well. This effect is broadly attributed to three classical influences (Chaudhuri, 2006):

- **The characteristics of the individual:** personality, perception, attitudes, needs, and motivations of the individual.
- **The environment of the individual:** culture, subculture, family, friends, and the institutions that the individual lives in.
- **The genetics of an individual:** biological codes which are unique to each individual.

Individual characteristics and related issues are necessarily going to be in the center of the designer's interest when he looks for the most efficacious way to address users' satisfaction. The other two influences could be considered as out of the designer's control. Our intuitive realization of emotional domain can be structured according to a polar distinction, positive and negative emotions (Deonna, 2012). Negative emotions, such as boredom, can affect our behavior negatively, just as positive emotions can affect it positively. However, positive emotions can also negatively affect our behavior, like when they direct us towards bad behavior.

2.4. The Components of Emotion

The term "emotion" is used to describe the "umbrella" concept that contains affective, cognitive, behavioral, expressive, as well as a host of physiological changes (Panksepp, 2004). Therefore, in order to understand emotions and use them in addressing users' satisfaction which can result from fulfilling their emotional needs, a deeper understanding of emotion's components and thereby understanding of emotions is required. This understanding will enable designers to find the best way to communicate emotionally with users by addressing their emotions and addressing their satisfaction, thereby gaining their loyalty. The components of emotion are:

2.4.1. Affect

Affect could be defined as the conscious or unconscious experience of intensity (Damasio, 1999); it is also a moment of unformed and unstructured potential. The existence of an influential component of emotions that includes a general positive or negative state such as joy, fear or anger, is also a definition of affect. Affect is abstract because it cannot be fully expressed with language, and because affect is always prior to and/or outside of consciousness (Massumi, 2002) and any information processing system (Norman, 2004). The relation between affect and experience could be described as product experience, and any change in the affect attributed to all kinds of user-product interactions (Demir, 2008).

According to the Desmet and Hekkert framework (Desmet, 2007), there are three levels of affect: the aesthetic level, which includes affect generated by sensory stimulation, the

meaning level, which refers to affect raised by the expressive characteristics of products, and the emotional level, which relates to an appraisal linked to an object. Controlling affect is possible when the action of perceiving the product helps users prepare themselves for a positive experience, this experience in which the users participate in formulating its quality (Massumi, 2002).

2.4.2. Cognitive Process

Cognitive processing is one component of emotion which is very important for humans. It is a perceptual process, which can be defined as "the analysis of perceptual or surface level features" (Eysenck, 2000). Cognitive processes include processes such as remembering, understanding, analyzing, etc., working together in formation of our thoughts, which are related to our knowledge, as well as explaining the relation between these processes and the way people use them to perceive object creation. Psychologists differ in the extent to which they emphasize the role of cognition in emotional arousal and expression.

There is a general consensus that perception, learning, and memory are all very deeply involved in experiencing emotions (Power, 2008), which indicates that the cognitive processing that causes the emotion is unconscious. Whereas informational and motivational effects of emotion depend on conscious experience in order to capture the attention of the subject of the experience (Barbalet, 2004). In other words, cognitive processing, from the users' viewpoint, is how they put their knowledge to use at the time of experiencing products, as well as what the previous experiences look like, all these experiences are stored in users' memories. Therefore, the designer may have the opportunity to guide this process in the direction of restoring happy memories resulting from previous positive experience with emotionally designed products. This guidance will establish the next purchase and further positive experience by extending users' happiness, which in turn may lead to acceptable and enjoyable products.

2.4.3. Psychological Arousal

When a person is awake or reactive to stimuli, it means this person is prepared for psychological arousal (Matlin, 2005, and Oliver, 1993). Indeed, emotions are associated with mild to extreme changes in the physiological processes occurring within our bodies, such as increased heart rate, blood pressure, and rapid breathing. Consequently, emotions are associated with emotional arousal, which may lead to some changes, such as facial expressions and other emotional signs (Parker, 2007). Psychological arousal is associated with

specific stimuli, whether they have been evoked in a positive or negative emotional situation or event. Mood states produce changes in physiological arousal as well as in cognitive activity (Eysenck, 2000), and a users' mood can change or shift from positive to negative state during their everyday life in response to many situations or events.

Therefore, psychological arousal should be positively stimulated or protected from being negatively stimulated, in order to prepare users to accept the designer's experience and emotions that are attached to the design. They should try to ensure user loyalty, or at least to avoid motivating those users to search for another designer who provides them with products that contain emotional content that better addresses their emotional needs. Designers should be aware of users' needs in general, especially those emotional needs their design is trying to address, not only to persuade users to purchase but also to offer them an extended positive experience. Users' psychological arousal will motivate and cause them to search for the best experiences possible because they have different levels of arousal that need to be accommodated (Dienstbier, 1989).

2.4.4. Behavioral Response

Behavioral responses represent the last component of emotion, and they refer to our emotions when they motivate us to act out or express our feelings (Parker, 2007). Reactions such as crying, smiling, tone of voice, and any other kind of body language are all common bodily and facial signals of emotions used for expressing our feelings. These behavioral responses may also serve to either promote or reduce emotion.

For example, avoiding a situation that produces fear is an example of behavioral responses maintained by a change in emotion (Norman, 2004). The focus of this research is not to measure these behavioral reactions, but to determine how to stimulate positive ones by using positive stimuli from the very beginning of design process until purchase and throughout products lifespan. These responses will be detected by directly asking users about their opinions and expectations from an emotional perspective, using qualitative and quantitative methods, to determine if they have reacted positively or negatively to emotional stimuli.

2.5. The Emotions of this Research Focus

There are different types and classifications of emotion, but it is preferable here to concentrate on the basic categorization of positive and negative emotions (Güngör, 2007) associated with the designer-product-user relationship. Considering this schema of categorization is key to

achieving the goal of this research; establishing simple optimization targets to maximize or provoke the good (positive emotions) and minimize or inhibit the bad (negative emotions). Positive and negative classification of emotions here refers to their psychological nature and effect, rather than moral one. From a moral viewpoint, a positive good emotion is one that is positively evaluated in the light of moral values (Ben-Zeév, 2010); for example, compassion is a negative emotion from a psychological viewpoint, but positive from a moral one. Love is positive from both perspectives. One of the main targets of this research is to offer the user a pleasurable design that elicits a pleasant surprise, evokes positive emotion, keeps the user attracted to the product by gaining their interest and trust, and prevents boredom. Provoking particular positive emotions and inhibiting or accommodating negative ones will improve the long term user-product relation.

Also specifying different emotions and controlling stimuli will help to avoid undesired emotions and negative reactions (Ortony, 1990). Some positive emotions intended to be evoked and a negative one to be accommodated as Table (2-1) illustrates.

Emotion	Elicited feeling	Desirable/undesirable
+Happiness	The product supports consumer desires, meets his expectations.	Desirable to user
+Interest	The product draws and holds attention	Desirable to user
+Surprise	The product offers unexpected features	Desirable when positive
+Trust	The product elicits feeling of confidence	Desirable to designer and user
-Boredom	The product has unappealing features	Undesirable to user

Table 2-1: +Positive/-negative emotions and emotional reactions to products (Envick, 2008)

From the psychological perspective, positive emotions are emotions involving positive evaluation of the object, positive motivation, and agreeable feelings (Turner, 2007). Positive emotions stimulate new product purchase intentions; repurchase intentions, and product attachment (Desmet P. M., 2012).

2.5.1. Emotion, Trust & Consumer's Loyalty

Trust has been identified as an emotional value of customer satisfaction, which can be divided into three areas. One of these areas is product equity (trust), which is the customer's subjective view of the firm and its offerings. This area includes awareness, attitudes, and perception of the product. Another area related to trust is retention or relation equity. It is the customer's

view of the customer-firm relationship strength, and it includes loyalty (Güngör, 2007). Loyalty means a deep commitment to repurchase in the future. However, there are two types of loyalty which are true long-term loyalty, and false loyalty in which customers seem to be loyal until certain benefits are exhausted (Boora, 2011). The first type is an emotional design goal capturing users' loyalty through continuous and renewable fulfillment of their emotional needs, even during product experience. Loyalty to an object (e.g. a brand, store, service or company) includes favorable tendencies such as behavioral or attitudinal inclinations towards that object, which may be over the long term (East, 2005). Loyalty is about product recommendations for future purchases, and not about the past. It relates to positive feelings and emotional perception towards the brand or product. Trust is what determines customer loyalty to a company or product, and to gain that trust it is necessary to provide what they need in the form of products and high quality customer service. If customer issues are resolved quickly and efficiently by following up with customers and meeting their emotional needs, the chances of increasing and repeat business are very much improved, and customer loyalty is built (Bishop, 2012). Loyalty is built on both past and present experience with products. To encourage the development of customer loyalty the designer must: 1) be aware of users' emotional requirements and 2) translate these requirements into real product features in the next generation of the product. And finally, 3) follow up on their emotional changes after purchase, especially those resulting from user-product relations. This depends directly on users' trust, which results from good quality, meeting their emotional expectations, and finally, ensuring a higher level of satisfaction by getting them fascinated with their products.

2.6. "Design for Emotion" and "Design for Use"

Design for emotion means improving the emotional quality of product design, upgrading the enjoyment of use, and extending this enjoyment throughout the experience of a product. This will be used to establish a new intellectual direction that aims at addressing users' positive emotions, and will represent the main goal of this research. Focusing on design for emotion rather than design for use should be considered as designing fundamentals for users' emotional satisfaction. The following differences resulted from a comparison between both types of design purposes (Table 2-2). Namely, designing for emotion is based on users' emotional satisfaction by placing users' emotions at top priority in the design process rather dedicating products to functionality and usability. Design for use may represent an easy task for designers to achieve, since they are able to test the success or failure before products have

been produced, whereas emotional design, considering emotions as main component of the design, cannot be tested - to some extent -without using and experiencing products.

Design fur *Use*	Design fur *Emotion*
Focuses on functionality	Focuses on emotional responses
Represents the "Ease" of use	Represents the "Joy" of use
Focuses on logic breaking points	Focuses on repulsion, falling out of compatibility
Focuses on errors and failure modes	Focuses on delight and pleasure modes
Emotions are un-reliable	Emotions as integral to usability

Table 2-2: Comparison between two types of design purposes; use and emotion

Moreover, without emotional content, and "if the product doesn't do anything of interest, then, who cares how well it works?" (Norman, 2004).

2.7. Theories of Emotion

There are some emotions we are able to recognize easily such as love, hate, disgust, joy, sadness, etc. Many emotional experiences may represent a blending of more basic emotions, and many theories try to explain these aspects of emotion and the way things are perceived. In the following, some theories of emotion which relate directly to this research focus will be briefly explained. Also, their description of emotions and the way in which these emotions have been stimulated will be mentioned, and then some of the support for them and criticism leveled at them will be mentioned. Some of these theories see emotion as independent of our behavior or specific events; others consider emotions to be an event resulting in our reactions as the outcome. Both of these types of theories will be explained to evaluate their content, and this evaluation will be used to support the goal of this research. More focus will be on Plutchik's theory and his wheel of emotion, since it is strongly associated with the purpose of this research. Generally, it is clear that all of these theories talk about stimuli that evoke a specific emotion, and how these stimuli trigger psychological and physical responses. Nevertheless, it is important to identify how to categorize and express the relationship between the different emotions and how they can be evoked or inhibited. Accordingly, this identification will elucidate the way to stimulate specific positive emotion and/or inhibit negative ones. However, what keeps conspicuous here that the theories of emotions focused on the stimuli that stimulate particular emotions, and how these stimuli triggers a psychological and physical responses, rather how to categorize and find out the relation

between different emotions. Therefore, discussion and analysis of Plutchik's emotional wheel should be taken into consideration.

2.7.1. Schachter and Singer Theory

Any theory should not only provide a cogent summary of some aspect of the world but should also have reasonable power of explanation. The Schachter and Singer theory posits that physiological and behavioral responses occur first; after the initial stimulus, the individual must then identify the reason for this arousal in order to experience it and label it as an emotion (Parker, 2007). It has kept that emotions depend on a kind of double cognitive interpretation: the appraisal of emotion-causing event and what is happening with our bodies' evaluation. The key process in emotional arousal is the way of our feedback from our bodies' interpretation, in the light of our present situation.

2.7.2. The James-Lange Theory

William James (1842-1910) and Carl Lange (1834-1900) both studied the relationship between emotion and physical changes in the body. In about 1885, they independently proposed that feeling an emotion is dependent on two factors (Strongman, 2003):

- The physical changes that occur in the body and the person's understanding of the body's changes after the emotional event. James and Lange believed that physical changes occur first,

- And then interpretation of those physical changes occurs, together, they create the emotion.

The James-Lange theory claims that emotion is not directly caused by the perception of an event but rather by the bodily response caused by the event. This means that in order to experience emotion, we must first experience the bodily response (Sato, 2010). In other words, there is an external stimulus that leads to a physiological reaction, and our emotional reaction is dependent upon how we interpret those physical reactions (Strongman, 2003, Chaudhuri, 2006). According to this theory, when someone experiences a threatening situation (almost being hit by a car), her/his body first sent out chemical messengers, like adrenaline, that caused physical changes such as increased breathing and a faster heart rate. His/her brain then sensed these physical changes and interpreted them as the emotion fear.

Briefly, the James-Lange theory expresses emotions as a result of an arousal that was created because of the perception of stimulus. For example, a car driver who has a sight of oncoming

car (perceiving a stimulus) will have his heart pounded as an arousal, which finally causes fear as an emotional response.

2.7.3. The Cannon-Bard Theory

In 1927, about 40 years after the James-Lange theory was developed, Harvard physiologist Walter Cannon (1871-1945) and his colleague Philip Bard (1898-1977) developed a new theory that related the workings of the nervous system to the expression of emotions. Cannon and Bard found that people could experience emotion without getting physical feedback from chemical messengers. They proposed that upon experiencing a stimulating event, information about the event is collected by the body's senses and is sent through the nervous system to the brain. In the brain, the message is sent to two places at the same time. The message is sent to the cortex, which creates emotions; in the previously mentioned case it created fear. At the same time, the message also goes to the hypothalamus. The hypothalamus is the part of the brain that controls automatic body responses. It tells the body to send out chemical messengers that cause the body to respond. Some of these responses are experienced as behaviors such as shaking, rapid breathing, and crying.

2.7.4. Plutchik's Emotional Wheel

Robert Plutchik's psycho-evolutionary theory (Plutchick, 1980) is one of the most influential classification approaches for general emotional responses. Plutchik's model includes four pairs of opposite emotions (Turner, 2007) and eight primary bipolar emotions which are: joy versus sadness; anger versus fear; trust versus disgust; and surprise versus anticipation (Fig. 2-1). These eight emotions are arranged on an emotional wheel, and in this model, all human emotions are variations or derivations of these eight (Parker, 2007).

Plutchik argues that the closer to one another these emotions lie on the wheel, the more they have in common (Wigmore, 2012); for example, he clarified that fear and surprise shares the quality of reacting to the unknown. Decreasing the chance of unpleasant surprise means the reduction of fear. This is one of the most basic goals of this research. Accordingly, involving the user in the design process will result in pleasant surprise and decreases the fear that design does not meet their needs, because this involvement ensures the fulfillment of the user's emotional needs and requirements. Ideally, the users' participation in the design process as co-designer, and the users' evaluation will enable the users to avoid unpleasant surprises. According to Plutchik's wheel of emotion, boredom- as negative emotion- is included under

disgust as the polar opposite of acceptance and trust. This means being bored with products could have different reasons; for example, if the product has unappealing features that stimulate product rejection. Involving users in their product's design processes will increase the chance of product acceptance.
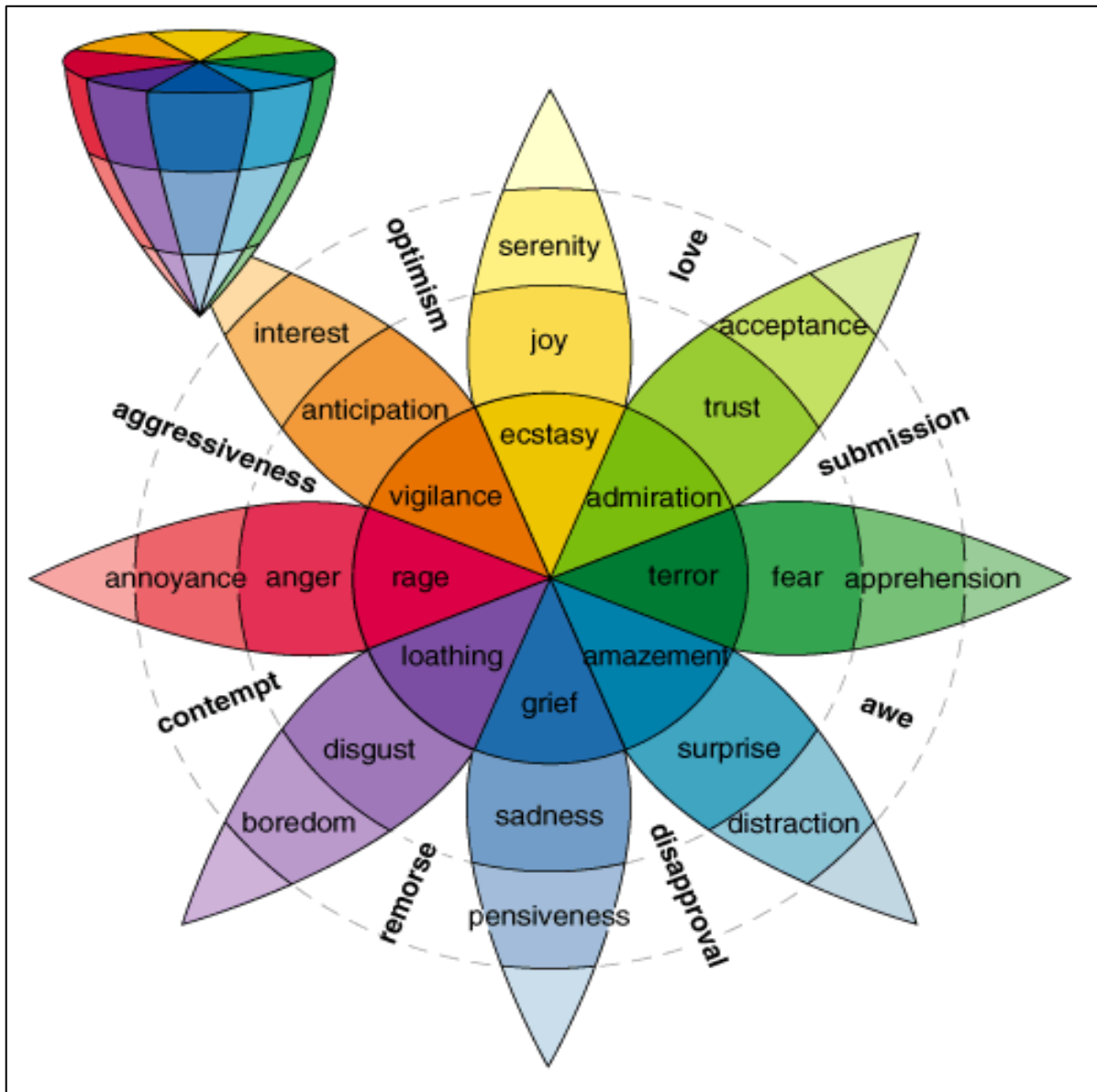
Fig. 2-1: Plutchik's Wheel of Emotion. The most relevant two emotions for this research: "Trust" and "Boredom"

Distrust may represent another facet of experiencing boredom, because trust as an emotion requires confidence in the designer. Moreover, trusting something, in this case, the product could be used as a stimulus event that acts as support for the product's acceptance and success (Parker, 2007). Therefore, the designer needs to attach some features to the product to keep users connected and attracted to it not being bored with or by it, and to maintain this

connection and attraction for as long as possible. Likewise, when users trust the designer, they will also trust the product insofar as the product elicits their positive emotions, since trust here represents the pathway to striking an emotional balance between the user and the designer.

2.7.5. Theories of Emotions: Support for and Criticism

Firstly, there are much evidence that support the various theories of emotions, since these theories concern the way emotions match or do not match different physiological responses. One of the perspectives that tends to support theories of emotions is Ekman's. Ekman looked for differences in patterns of physiological responses to stimuli (Ekman, 1992). Laird (Laird, 1984) conducted an experiment to match facial expressions with specific emotions. In particular, Laird found that smiling made participants feel happier. On the other hand, there is some general criticism which has been leveled at these theories based on emotion experience and the emotion-psychology relation:

- The way to use cognitive reappraisal strategy as an emotion-eliciting event in a way that changes the emotional impact before it occurs (Gross, 2003), and that what these theories did not consider.
- Sometimes emotions are experienced *before* we think about them (Reisenzein, 1983).
- Different emotions with different arousals may have similar physical and/or facial effects or reactions, which add to the difficulty of measuring emotions (Marshall, 1979).
- These theories did not associate the relation between the regulation of everyday usage and experience of things and stimulated emotions, as individuals frequently separate the experience of emotion from its expression (Gross, 2000).

There are general support and weakness to the theories of emotions that can be illustrated in table (2-3). However, on the other hand, the focus here is attempting not to create a new tool or developing an existing one used for measuring the physical or facial emotional responses or reactions; it will focus, rather, on stimulating and detecting these particular emotions in a qualitative and/or quantitative way through direct investigation with users.

The focus of this research is to involve users in the design process to prepare them to positively perceive the new product, accordingly attempting to change the impact of the emotions elicited by the design before it occurs, or at least to prevent the product from being negatively perceived.

Theory	Description	Supporting Evidence	Weaknesses
Schachter-Singer Theory	Physiological and behavioral responses occur first, then one cognitively evaluates the situation and messages from the body to interpret or label the emotion.	Results of study with subjects who received epinephrine injections and were informed, uninformed, and misinformed	Some sudden emotional experiences seem to happen faster than would be predicted if they are necessary to evaluate the situation and physiological response.
James-Lange Theory	Environmental stimuli trigger physiological and muscular responses, which then activate emotional states. Different physiological responses result in different emotions.	After spinal cord injuries, people report less intense emotions. Negative emotions show specific hysiological "fingerprints"	-General physiological reactions associated with a variety of emotions are similar (for example, increased heart rate) -Completely ignores the role of cognitive processes. -Emotions seem to happen too quickly to be accounted for by the release of chemical messengers and the changes they cause. -Different emotions (for example fear and anger) have been shown to cause the same physical responses.
Cannon-Bard Theory	Subjective experiences and physiological and muscular responses occur simultaneously and are triggered by the thalamus.	-	Perceives emotions as automatic reactions and does not discuss the role of cognition in evaluating emotions
Tomkins' facial feedback Theory	Facial muscles respond to a variety of situations automatically, and feedback from facial muscles determines emotional experiences.	Cross-cultural similarities exist in facial expressions. If face is "posed" into a negative expression, individual shows physiological	

		response characteristic of the emotion	
Solomon and Corbit's opponent-process Theory	Emotions exist in opponent process fashion. After one strong emotion is experienced, the opposite emotion is activated to restore emotional balance. With repeated activation of one emotion, the intensity or the original emotion weakens and the intensity of the opponent emotion grows stronger.	Accounts for "addictive" behaviors such as mountain climbing, and also accounts for additions to drugs such as heroin.	

Table 2-3: Theories of Emotion-summary table solution (Parker, 2007)

2.8. Understanding Perception

The subject of perception, from Plato and his interest about the way we perceive knowledge, to modern theories, is quite rich in literature. Perception could be simply defined as the detection of information (Michaels, 1981), while Rookes and Willson (Rookes & Willson, 2000) defined it as a process which involves the recognition and interpretation of stimuli that are registered by our senses.

"Are we really perceiving a world, we must instead say: the world is what we perceive"

(Merleau-Ponty, 2002)

This statement condenses the different perspectives of perceiving our surroundings, because perception is concerned with the way of making sense of surroundings and how to interpret appearances. Perception of objects differs from one person to another. Everyone has his own sensory experience of the world around. This sensory experience involves both the recognition of environmental stimuli and actions in response to these stimuli (Merleau-Ponty, 2002) leading to variation in detecting or recognizing surroundings. Krippendorff argues that the use of artefacts is not separable from how users conceive of them and engage with them in their world (Krippendorff, 1989, 2004). Krippendorff perspective indicates that the central point of any design activity is the identification of the meaning which the product should offer to people who will use it (Giacomin, 2012), accordingly providing users the opportunity to construct their own meaning should be considered. These are some simple definitions and

understandings about perception which may help to direct positive user perception. Since perception is associated with stored memories, shaping these memories with positive experiences and related factors will help to generate a positive reflection on the related products during the user's next purchase process.

2.8.1. Perception and Emotions

Emotions follow behavioral and psychological reactions, and perceptual processing is central to emotional experience (Parker, 2007). In addition, there are three hierarchical levels of perception that control the mode of perceiving object, as it is not possible to design without them. They are: visceral, behavioral, and reflective. Schachter effectively argued that the viscera, where the visceral level occurs, appears to be necessary and it is hard to ascertain whether emotion can occur without visceral involvement (Strongman, 2003). The visceral level necessitates the existence of visceral design, which deals primarily with the initial impact of design appearance. The behavioral level, meanwhile, is the site of most human behavior (Norman, 2004), and accordingly, an aspect of design called behavioral design has been created. This aspect is about the look and feel in the total experience of using a product. Attempting to satisfy emotional design criteria at the behavioral level often entails a thorough evaluation of usability (Aumer-Ryan, 2005). Finally, the reflective level is where conscious thinking about objects takes place and memories are constituted. Reflective design is one's thoughts after initial contact with the product; the way it makes one feel, the image it portrays, and the message it tells others about the owner's taste (Norman, 2004). The concept of emotion and the way we feel is one of the basic components and evaluation systems of our everyday life, or everything we perceive, whether these responses are facial, psychological, or physical.

Users have their private and special tools to realize and perceive objects in the case of product design or anything else. Perception includes the five senses; sight, hearing, taste, smell, and touch, this is the simple construction of our perceptual system. However, if we try to find out more about this system, we will find that it essentially consists of basic physical and mental components that control our decision making. These components can be simply clarified as follows (Saad, 1984):

- **Receiving:** Represents the seeing, hearing, smelling, touching, or tasting systems of the user. One or more of these represents the first communication means between the user and the product. Furthermore, through this process the user can recognize product properties such as form, texture, color, and/or any other properties of appearance. At

this point, the receiving process is responsible for sending particular feelings or impressions to the analysis component.

- **Analyzing:** Responsible for receiving messages from the receiving sensor and subjects it to the process of visual analysis of contents by using the user's memory related to previous experiences with similar products, practices, or knowledge of the product's different aspects. The end result of the analysis process is what we call the recognition.

- **Memorizing:** Where previous experience and knowledge have been stored, and this storage may influence the analysis process of the visual components.

- **Comparing:** Can also be called the evaluator, where the results of the analysis process are compared. These results mostly relate the present perception of the object to previous impressions of similar objects. The final decision is a result of this process.

In short, perceiving a product takes place after an interaction between users' vision and feeling is processed in light of their previous experience, knowledge, and their hidden desires surrounding the product. Therefore, the more aware the designer is of that perceptual system, the more he can affect a part of that system to increase product acceptance. The user is then convinced by the product, and makes the decision to purchase it.

2.8.2. Designer-Product-User Perceptual Relation

More specific definitions of perception refer to the conscious or phenomenal experience of senses, and we do not perceive a fragmented pattern of light, shade, and edges; we 'see' a face or 'hear' a voice. This is the perceptual experience which represents the final output of perceptual processing (Styles, 2005). If one looks at the designer and user as human beings, we will find that both of them consist of the same components and senses, and that these components determine the dynamic relation between them. Product acceptance and the user being convinced is the confirmation that the product has been well designed. To reach this level of confirmation, both the designer's and user's vision for products should be changed to cope with and match each other, in order to obtain successful and enjoyable products (Saad, 1984). How to reconcile the differences between the designer and user from the perceptual perspective requires explaining these common components (Fig. 2-2) as follows:

- **Feeling:** The formation control of a specific vision about the product and its elements. These elements may include form, color, texture, and the other appearance components which are perceived individually or together.

- **Experience:** Constitutes the main component which is referenced in the process of analysis and comparison between different products.

- **Evaluation System:** combines all given elements and interactions together, to reach a certain decision which weighs the trade-off between the value which the user will obtain and the overall cost to the user.
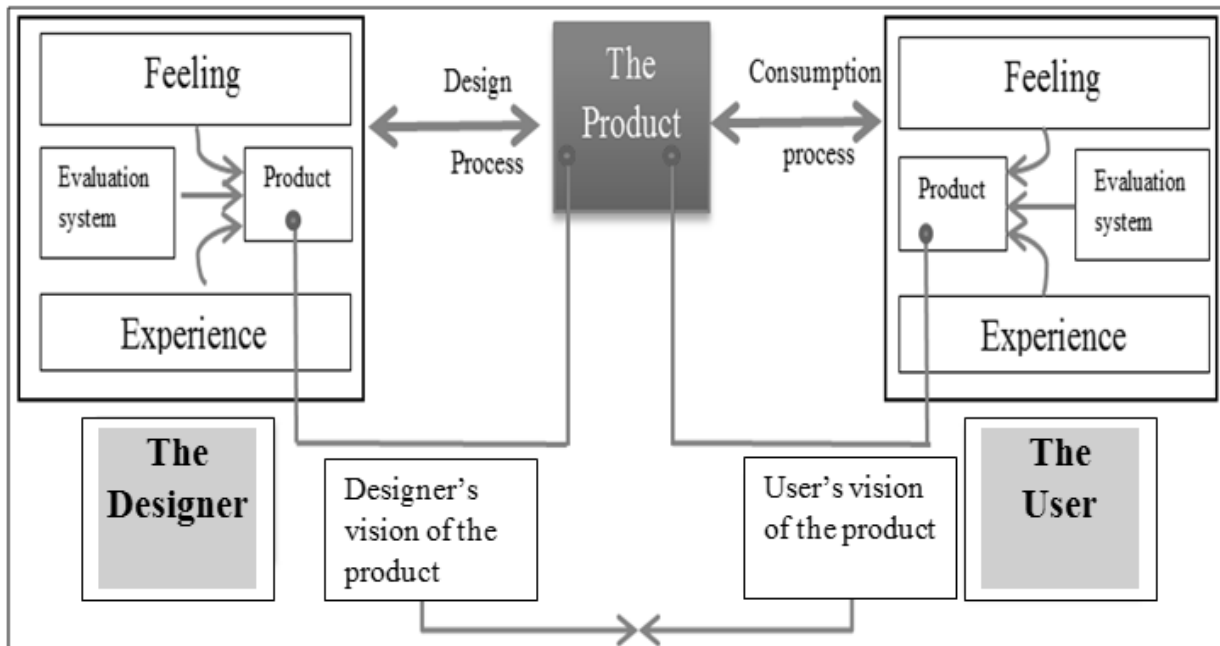
Fig. 2-2: With similar experience strategy, Designer/User's product perception may conflict (Saad, 1984)

In addition, there is another common intention for both the designer and user; this intention is the achieving of product success. The designer hopes that his product design will be widely accepted among the largest possible number of users, and the acceptance is the indication of how successful the product has been. At the same time, users always insist on having successful products that provide them with satisfying experience or they will simply search for the products that offer them this satisfaction.

2.8.3. Perception and Previous Experiences

The complexity of human responses to everyday things is determined by a wide variety of factors. Some of these factors are related to users themselves, such as their own previous experiences. Also, in the process of perception, we gain information about elements and properties of the objects surrounding us, and then we store these properties until we need to use them in another situation or experience. It may be useful to note a possible link between intuitive perception and positive behavioral attitudes towards objects. It might be that more

intuitive individuals see more possible uses for these objects, and that as a result they will be used more often (Noyes, 2002). Perception creates our experience of the different objects around us; it also allows us to use the previously gathered feedback within subsequent similar situations (Styles, 2005). There are some hidden perception complexities which psychologists are trying to understand. They ask some questions, such as: How important are factors like previous experience in determining perceptions? In order to answer this question and referring to Fig. (2-3), the following can be considered.
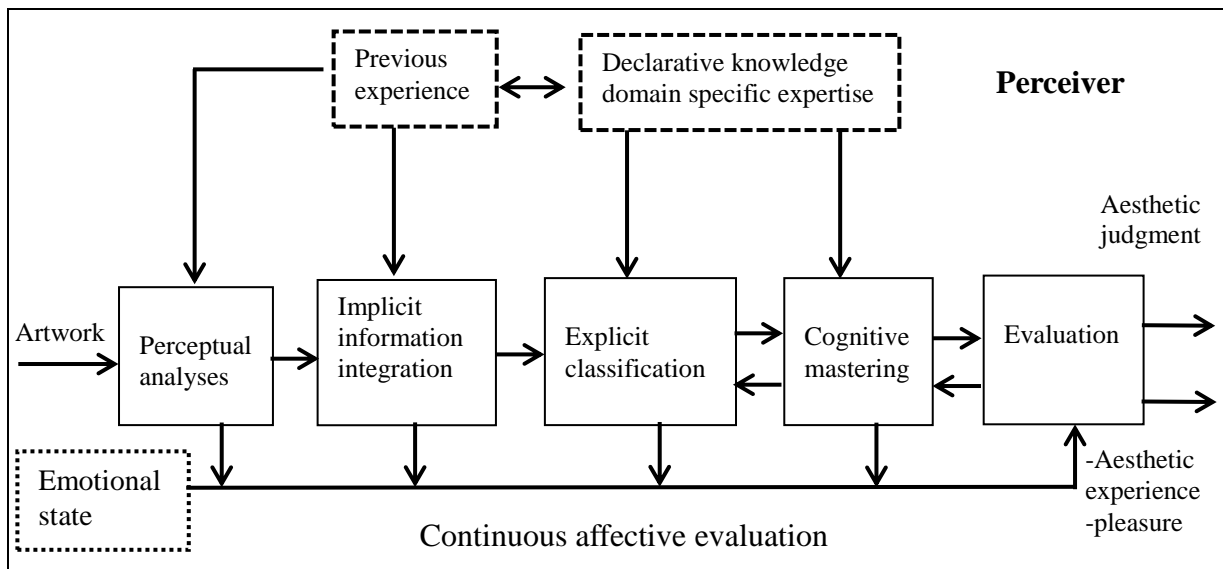
Fig. 2-3: Emotional State, Perception, and Previous Experience (Hekkert, 2006)

In other words, past experiences will leave a memory in the brain, and when we re-encounter these things, these memories will affect our perception. With this in mind, to control and direct the user's next decision-making process towards a designer's specific product the designer should take care to recall positive experiences in users' memory to motivate them to perceive the design positively at the next purchase time. Conversely, providing users with negative memories or experiences with products will leave the users unwilling to purchase these products again.

2.9. Reasons of the Emotional Design Failure

According to the last few sections, the problem is simple: human-centered design can emphasize or ignore certain needs. This is not a criticism to HCD rather a focus on the possibility that HCD as being concentrated on meeting users' usability and functionality needs while ignoring their emotional ones. It is obvious that the economic benefit of HCD in

business settings as an approach for designing products, systems and services which are physically, perceptually, cognitively and emotionally intuitive (Giacomin, 2012).

A designer, who takes people real needs into account, runs the risk of ignoring certain needs. People have emotional needs and aesthetic pleasure, and this should be the base and the starting point of any design process to create good design. Consequently, when products do not add to our aesthetic or emotional pleasure, they may fail, because their design is simply not centered on human emotions (Norman, 2004). The problem with these designs, especially furniture, is that they are works of art, meant to be accepted only visually as objects standing alone, the design focuses upon itself, and not upon those who must live with it according to Donald Norman's viewpoint (Norman, 2004). Furthermore, emotional design may fail because the vision of the designer and user do not match, like when the emotional communication between them is not strong enough. Scott Berkun (Wroblewski, 2008) recently published a survey of 389 participants on why designers fail. The survey explored reasons why designers and people who work with designer's fail; it describes why designers don't achieve the results they desire. Berkun concluded one of the top reasons for failure is that designers do not follow up their users emotions. This confirms the connection between designer failure and the design that fails to take users' emotions into account, not only during the design process, but also throughout the experience time with the products.

Chapter 3 continues the literature review in the field of design and its components. It focuses on various design elements such as line, shape, form, texture, appearance, etc., and how these elements can be presented to deliver specific emotional content to the users to achieve the desired emotional effect. This chapter also looks at how to positively influence users' perception using these components individually or in the form of a final product, and to specify every element's ability to contain emotional messages parallel to determining the target users to whom this message will be sent. This is followed by a clarification of the co-design approach, the reasons of applying it, its role in fulfilling users' emotional needs, as well as clarification of the mass customization and its role in constructing products according to users' emotional needs before purchase.

Co-design and mass customization in this chapter were used to get user feedback which is used as a basic strategy for a developed design process to result in an emotional product.

Chapter 3

The Psychological Impact of Design Element: Aesthetics from an Emotional Perspective

3.1. Introduction

So far, some literature has discussed the psychological and aesthetic values of design elements in detail. These studies addressed the explanation and elaboration of many issues related to the field of design elements and their aesthetic impact on users. In this research, the findings of these studies will be used as a means of identifying the most effective way of using and directing this impact to ensure users' positive first impression. This effect will also be used in helping the designer deliver emotional messages in the design elements to the user from the moment of purchase. Furthermore, this impact will be used to strengthen the user-product relation by converting this relation into pleasurable one for as long as possible without boredom arising in long-term usage.

Accordingly, there is a need to analyze the aesthetic and psychological effect of design elements, both individually and when these elements have been joined together in the design relation represented by the final product. These elements include line, shape, emotional value, emotional touch points, and appearance. Design elements and appearance which consist of all or some of these elements will be studied and emotionally evaluated in order to understand and clarify the role these elements' physical and aesthetic properties play in users' product perception and evaluation, as well as to determine how these elements deliver the designer's emotional messages to users throughout their experience with these products. Aesthetic experience is restricted to pleasure or displeasure which results from sensory perception (Hekkert, 2006), and design aesthetics include a variety of features that contain messages to the user who perceives them as pleasant or unpleasant. Aesthetics are considered one of the major fields related to design features that can address users' emotions directly and from the very beginning of user-product contact point, as they are the tool used for strengthening user-product communication, especially at purchase time, while first impressions are being configured. However, aesthetic values involved in products can influence more than just communication; they are one of the main factors that make products meaningful, which ultimately improve product performance, enhance user perception, and sets up product longevity (Hjelm, 2003).

In order to clarify the importance of aesthetics in product performance and efficiency, pleasure in product aesthetics is supported by ease of use; therefore, the aesthetic product will perform better than the unaesthetic one (Creusen, 2005, Norman, 2004, Lewalski, 1988), and will also be more enjoyable in the long term (Jordan, 2003). This approach places the role of

aesthetics in an enjoyable product experience at the top of the designer's priorities. In addition, design elements may contain hidden and/or apparent messages sent from the designer intended to be received and understood by the users. These messages enable the design to communicate with the user and ultimately determine its success or failure. These elements have been researched according to a specific set of individual characteristics such as color, line, shape, etc., or combined elements of some or all of these components, such as overall form and appearance.

3.2. Design Elements and Aesthetics: Color

The elements of a design are those components or parts that can be defined in any visual design or work of art. They are the structure of the work, and can carry a wide variety of messages through their aesthetical content. A good design can speak while products cannot (Kejun, 2008), and good designs bring across messages to consumers without needing to verbalize them. Design elements individually or/and together are a medium which the designer can use to send his messages to the user. It is necessary to examine different ways in which design elements arouse consumers' emotion and represent a means of exchanging emotional contents and demands between designers and users, especially when designers begin to create new products or develop existing ones. When users interact with products after purchasing them, this represents the second communication point after their first contact with the product within design process. Understanding users' aesthetic needs, including aesthetic and emotional contents and meanings in the design elements, and designing for users' positive experience are the goals of studying design elements and their ability to enable the exchange of emotional content between designers and users.

The first and most important element where the first impression and attraction take place in the course of a user's visual linking with a product is color. As colors play a major role in how the design is perceived, and they are perhaps the most important element of design. They can be chosen by designers to be assigned to an object, and then be totally or partially accepted or rejected according to a user's viewpoint and/or taste (Morton, 1997). Colors can be chosen by the users themselves by investigating users' desired colors indirectly such as market surveys. There is another way to explore users' color preferences with more efficiency while increasing the likelihood of product success. This strategy is based on involving users directly in customizing various aspects of their products such as color or other design components from the early design phases. An effective design strategy is one that considers color choice with

color's psychological importance and effect in mind, as colors are psychophysical entities and deeply influence the human psyche (Mausfeld, 2003, Davis, 2000).

Furthermore, users may perceive colors positively or negatively, so color perception is an indicator of whether the emotional content sent from the designer has been delivered to the users or not. The way colors can be used in providing users positive relationships with products and ensuring their satisfaction should be studied as one of the main concerns for designers. The focus in this section will be on the emotional impact and positive symbolic meanings of colors. This research looks to reveal and emphasize the positive effects of colors (Peacocke, 1997), as well as avoiding any negative impact on users' emotions and the way they perceive the product. Using color to stimulate and influence users' perception positively is the base of exploring the emotional effect of colors. Color is a key design element that delivers powerful message through the visual contact. Color affects users' moods, influences their psyches, and represents the most expressive of all design elements. As such, it is important here to note that choosing colors depends not only on a designer's choices or color's psychological and emotional effect, but also on the user's emotional and aesthetic preferences. Furthermore, the nature of the perception, stimulation, and reflection of color should be outlined and determined to enable attaching their effects and meanings onto design components in order to stimulate specific positive emotions (Heurley, 2012).

3.2.1. Perception of Color and its Emotional Impact

In the following sections, the focus will be on applicable basics of colors that all designers and users/consumers consensually agree upon. Colors may have meanings aside from their emotional arousal (Demir, 2008), which means that every user has his own personal and individual meaning in choosing colors. The designer's choice of colors and their combination could be powerfully effective in influencing design perception and acceptance or rejection, because approximately 62% to 90% of the assessment is based on colors alone (Singh, 2006), and color perception contributes to shaping the emotional response as well (Codispoti, 2011). Also, the majority of researchers have agreed that perception is a process of information construction that can integrate various effects, and that our senses use this information to judge what we see, smell, or taste (Heurley, 2012). Color is the most effective element and we perceive it even before we "read" the object or identify the forms. Color creates an atmosphere in which the rest of the user's perception of the product takes place (Lauer, 2008).

Moreover, from the psychological perspective, our responses to color are not only biological; colors have both emotional and psychological impacts that affect how objects are perceived (Engelbrecht, 2003). Colors can also capture our attention and motivate us to react according to our own experiences and beliefs (Lim, 2009). It is important to focus on users' "attention" to color, not only by using colors to attract them at purchase and decision-making times, but also by using them to keep the users attracted throughout their experience with the products. Later on, this relation may weaken or fade because of the absence of the emotional renewability in the design. User-product relation weakness can also be caused by boredom with products. In addition, emotions can be invoked by a stimulus or psychologically negative mood which can impede or decrease the perception of emotional stimuli (Bocanegra, 2009); this means that stimulating users' emotions by a specific color may be accomplished once one has found out which color raises which emotion. But, how to choose colors or their derivatives to stimulate specific positive emotions in spite of every individual user or group having their own taste? There are two different ways of using color according to users' perception of colors. These two ways are:

- **Reality or local colors**: This means the color that something appears (Mausfeld, 2003), and this is the abbreviated and direct way to choose colors according to their meanings. It is a simple language between the designer and user, assigning colors exactly as users are used to perceive. This is understandable to both of them, as it is about expressing a visual truth.

- **Expressive colors:** This is how designers can use color to express an *emotional truth* (Kraut, 1992) like using redness in someone's face to imply her or his anger or excitement (Strapparava, 2010). This may cause conflict between the designer's intended content in the design as expressed through colors and the way the user will perceive them. This conflict may extend to a deeper level when users need to change colors because they became bored with the color/s of their products.

On the basis of these considerations, it is important to provide users color alternatives or the flexibility in changing the color of some or all product components. This flexibility or option will establish a balance between designers' choices (colors with visual or emotional truth), and users' perception of these choices.

3.2.2. Colors Psychological Meaning and Dynamic Moods

Admittedly, there is positive and negative psychological meaning to every individual color we deal with in our everyday life. It will be better in this section not to mention everything about

colors, because they vary from one person to another according to everyone's taste and perceptual systems (Hatfield, 2003). The goal of this research is not, however, to impose specific colors on the users and persuade them to perceive it positively by convincing them by its meaning or psychological properties.

This research is primarily concerned with providing users with customizable multicolored designs to enable them to change their product's visual appearance using changeable designs and color schemes. This will help users to accommodate many of their emotional changes that may occur during their experience with these products, as well as keeping users connected, visually, at the very least, to their products. There are three primary colors (red, blue, and yellow) in addition to the two achromatic colors black and white, from which all colors are derived. It is important to clarify these colors and their positive psychological properties, since the main goals of this research are associated with positive color perception:

- **RED:** A physical color and positive as it evokes feeling of physical courage, strength, warmth, energy, stimulation, and excitement. It is a powerful color because of having the longest wavelength. It has the property of appearing to be nearer than it actually is and therefore it grabs our attention first, and that can be the main reason for choosing red as color to be applied in a design (Morton, 1997).

- **BLUE:** An intellectual color which represents features such as intelligence, communication, trust, efficiency, logic, coolness, reflection, and calm. Blue is the color of the mind and it affects us mentally, unlike the physical reaction we have to red. Strong blues will stimulate clear thought, while lighter and soft blues will calm the mind and aid concentration and support clear communication. Blue objects do not appear to be as close to us as red ones (Hoss, 2004).

- **YELLOW:** A strong yellow is a cheerful, emotional color; it represents some positive characteristics such as: optimism, confidence, self-esteem, extraversion, emotional strength, friendliness, creativity. The yellow wavelength is relatively long and essentially stimulating. In this case the stimulus is emotional; therefore yellow is psychologically the strongest color (Morton, 1997).

- **BLACK:** It is the absence of light or a mixture of all colors. Black conveys positive properties such as: sophistication, glamour, security, emotional safety, efficiency, and substance. Black creates protective barriers, as it absorbs all the energy coming towards us

and it is essential since no wavelengths are reflected (Sherman, 2009). Positively, it communicates absolute clarity, communicates sophistication and uncompromising excellence, and works particularly well with white. Black creates a perception of weight and seriousness (Marquize, 2010).

▪ **<u>WHITE</u>:** White is about hygiene, sterility, clarity, purity, cleanness, simplicity, sophistication, efficiency. Just as black is total absorption, white is total reflection (Sherman, 2009). It is often a strain to look at, and it communicates. White is purity and, like black, uncompromising, and sterile. Visually, white gives a heightened perception of space (Peterson, 2007).

3.3. Design Elements and Aesthetics: Line

Line is a mark made by a moving point which has psychological impact and communicates emotion and states of mind according to its character and direction. Horizontal lines are calm and quiet, vertical lines suggest more potential for movement, while diagonal lines strongly suggest movement and give more of a feeling of vitality (Shawky, 2005). Lines can be combined with other lines to create textures and patterns. However, line is not always explicit; it may exist by implication, such as the edges of forms (Jirousek, 1995).

3.4. Design Elements and Aesthetics: Shape

Shape is an area, color, value, or texture defined by a boundary or surroundings; it is a two-dimensional object; which has height and width but no depth (Stout, 2000). Geometric shapes, such as circles, squares, triangles and rectangles, are based on mathematics and have straight edges and regular curves. Importantly, a shape is also defined as an area that stands out from the space next to or around it due to a defined or implied boundary, which can be known with shapes seen from its negatives because of differences of value, color, or texture.

From the perceptional point of view, shape is the external outline of an object such as a design, product, or any other form. We have a spontaneous perception of shape that is probably connected with the deepest levels of our perception of the world around us (Vieru, 2009). According to our emotional response to shapes, a designer should involve shapes in his design to connect our emotions and shapes as advantage tool (Hummel, 1998). At the same time, it is very important to understand the impact of shapes on perceiving design to address users' positive perception since their first visual contact with products.

3.5. Design Elements and Aesthetics: Form

Form is a three-dimensional geometrical, it refers to the way the design elements have been united (Lidwell & Kritina Holden, 2010) and how they have been visually and perceptually combined. Form is defined here to dispel the confusion between forms and shapes and to recognize how to perceive both form and shape. It is also defined to control the role forms play in design success as one of the main visual and aesthetic components of design. Furthermore, forms have the ability to carry emotional content and messages from the designer to the user, accordingly a new approach have been introduced to the field of design and emotion. Whereas "Form follows function" is a famous principle associated with designing objects in the 20th century and links object form to purpose/function (Zen, 2006), "Form follows Emotion" is a new approach that focuses on an advanced level of the importance of product form, and is concerned with emotionality instead of functionality. "*...Even if a design is elegant and functional, it will not have a place in our lives unless it can appeal at deeper level, to our emotions*" *…….*

Prof. Hartmut Esslinger (Demir, 2008).

There is a link between form and emotion that has been clarified according to Wallach (Wallach, 1953) who assumes that there is an impact of our past experience that plays an important role in perceiving form, and set out to demonstrate such an effect in a rigorous way. At the same time, our previous experience has been shaped by our emotions and memories, which in turn refers to the link between emotion and form. The more our experience is associated with positive emotions related to a design component like form, the more this will establish for the positivity of the next experience, depending on positively perceived forms in the past. Likewise, the "Form follows emotion" approach emphasizes the importance of form in product design, as form plays an essential role in provoking users emotions. Form is the first emotional contact of the product visual feature such as shape and color, with the users, and therefore the first impression. The form of a product communicates a personal and emotional meaning.

3.6. Design Elements and Aesthetics: Texture

There are two different spectrums in design texture; smooth to rough and soft to hard. Textures are what determined our tactile experience of the product (Wong, 1993). The definition of texture is the surface characteristics of a material that can be experienced

through the sense of touch, whether real or illusory (Paschke, 2000), there are 2 types of texture (Fig. 3-1):

- **Tactile texture:** The actual 3D feeling of a texture that can be touched and perceived. This type of texture is applicable to all 3D textures (Nakayama, 1992).
- **Visual texture:** This is can be an illusion that creates an appearance of texture. Visual texture is applicable to all 2D textures (Bai, 2008).

These two types of textures help users to perceive any surface physical properties by the use of the sense of touch and according to their previous experience and knowledge. Texture is a tool the designer can use to communicate with users by using either appearance (visual) or real material (tactile) in order to enrich visual and aesthetic properties of surfaces (Manning, 2012).
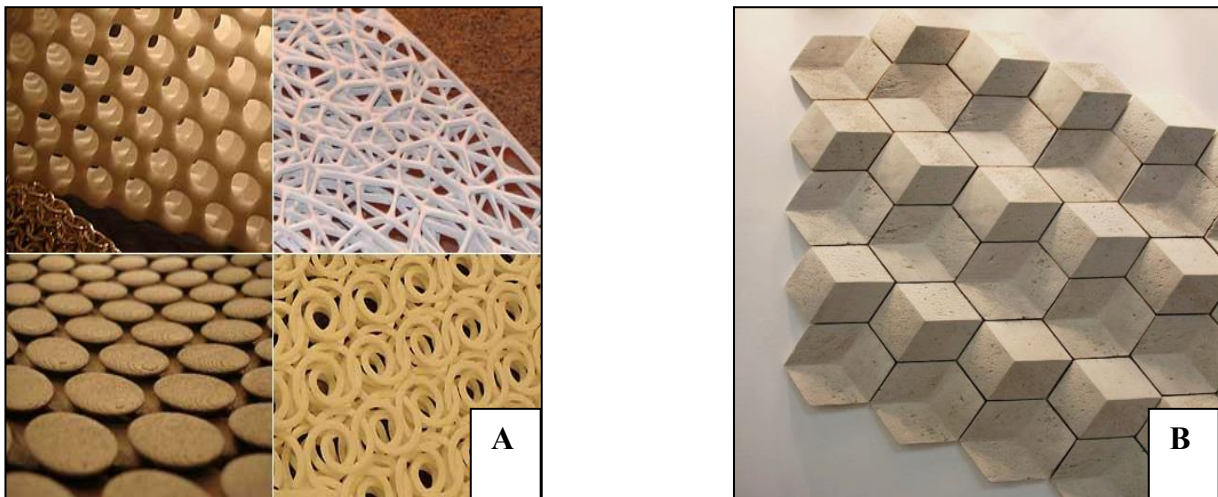
Fig. 3-1: A. Tactile texture (real material with touchable texture).
B. Visual texture (just an image for texture).

3.7. Design Elements and Aesthetics: Emotional Value

Value refers to the relation between dark and light in a work of art, but it includes another meaning in the field of emotion and design. Value can also be something not related to a design's visual elements, but rather associated with a hidden property or with the content of the design. Value can be an invisible message to users' emotion and can be involved in the design, as emotions - especially positive ones - can add extra value to a product (Chang, 2007). It can be attached to the design, thereby providing an emotionally rich user-product interaction, as products that include emotional value can be more closely associated with the users and support better user experience (Lee, 2007).

At the same time, visual symbols which play an increasingly important role in our daily life are one of these values when they are attached as signs to the design features (Thorlacius, 2007). Visual symbols and details (decorative details, story behind design, etc.) are one of the major effective values that can be added by designers to their designs. Values, when effectively added and used in design, will represent enduring quality in an object. Furthermore, values can change users' experience with products positively, because they configure everyday practices, and consequently formulate cultural values of use and exchange (Shove, 2005), which in turn shape our entire life experience.

3.8. Design Elements and Aesthetics: Touch Points

Touch points are all about communication (physical and/or psychological) and human interactions that users experience during their relationship cycle with products (Choy, 2008). Use of products or services themselves is a basic touch point, because it is a tool used to discover how often designers can reach their customers.

Touch points are related to the way a relationship between the designer and user can be established and the way they can communicate through design (Franke, 2009). At every stage of a product from design to purchase and experience, there are certain touch points. Once a customer's experience touch-points have been identified, the aspects of the interaction can be modified according to the design stage as follows:

- **Pre-Purchase:** This stage has several touch-points where each has a specific tool that can be used to deal with it. Managed communication tools (Kejun, 2008), for example, can be found in adverts, websites, point of sale materials, sponsorship, etc.

- **Purchase Stage:** This stage is related to the design after it has been produced and can be represented in product packaging, order confirmation, and price list.
  Also, product usage is included in this stage and related to practical and emotional experience.

- **Post Purchase Stage:** the most important stage that includes product experience and consequently motivates the next purchase. This stage can be improved by the designer through following up on users' emotions and relations with products to know their impressions, whether positive or negative, their complaints, and any problems associated with their product experience.

3.9. Design Elements and Aesthetics: Appearance

Appearance is the last element that accumulates and presents the formal and aesthetic components of the product in its final visual relations, and contains the all previous elements. Design appearance is not only perceived by the user, but also reflects what designers themselves perceive in a product design (Blijlevens, 2009). Designers who are capable of involving certain emotional meanings using design appearance can increase the product's chance of success (Creusen, 2005). Design appearance was defined in Oxford English Language dictionary as the way something or someone looks; it is related mostly to the impressions that were given about something or someone. Referring to the importance of appearance in product choice and/or decision making, there is an important question which is: how does one brand of water distinguish itself from another?

The answer is packaging when package becomes the design, the design, in turn, becomes the product itself, and packaging here is all about product appearance (Norman, 2004). In such a case the appearance is the single most significant factor. Donald Norman mentioned three levels of perception. The first one is visceral level which relies on appearance and shapes our first impression of what we perceive (Norman, 2004). Thus, the visceral level represents the most significant means by which anything we perceive can come across successfully, and positively influence our purchase decision. Furthermore, to realize consumer pleasure, it is necessary to find out more about how this consumer perceives a product's appearance and its hidden meaning (Chang, 2007). Appearance is the starting point of attraction to or disaffection with a product (Bloch, 1995), and the thin line between the two opposites like and dislike depends upon it. The importance of appearance in this research will be expressed according to these considerations and as the answers to the following questions:

- How can exclusively positive emotions be evoked by appearance?
- How can the appearance of a product be linked to the three hierarchical levels of perception to maintain positive emotional communication between the user and the product as long as possible throughout the product lifetime?

3.9.1. Appearance: from First Impression to Emotional Satisfaction

It is important to emphasize the role of appearance in perceiving products, especially at the moment when first impressions are configured to motivate and direct a user's decision. There is a relation between product appearance and first impression that can be explored through

explaining the different phases of experiencing products. Every moment of user experience is full of emotions, according to the stage the user is experiencing:

- **Phase of product first impression:** Here judging the product value and aesthetic preferences are used to form the first impression, directly influencing emotion (O'Shaughnessy, 2003), then;

- **User satisfaction:** It represents the most important common goal for designer and user while a product is being experienced, where trust and a positive user-designer relationship can be established (Güngör, 2007), and finally;

- **Longevity:** The key to long term product success and forming a positive emotional relation between the users and the product for as long as possible. People will become attached to objects because of the feelings the objects generate in them (Norman 2004)*, so the longer the product satisfies and meets the user's emotional needs, the more the relation between them can be strongly and positively extended.

However, the importance of appearance, the role it plays in user-product communication, and the role that design appearance plays in supporting designer-user communication (Saffer, 2007), all need to be clarified from the emotional perspective. Appearance is the single most important factor that motivates users' decision making (Chang, 2007, Dawar, 1994), just as form and color are key in the acceptance or rejection of the product. Considering this importance, it is valuable and essential for designers to provide users with products that take into account this importance. At the same time, when consumers see a product's appearance, they perceive certain physical properties that together constitute the design of this product (e.g., color, shape, and texture); these elements play a key role in product attractiveness. These properties and the way they have been perceived formulate the first impression, whether positively or negatively. They also provide users with feedback which controls and orients their decision to repurchase. This is all about translating users' emotional satisfaction to concrete purchase choices; their emotional needs have either been met or ignored. However, there are three main known phases of consumer responses that identify different types of consumer satisfaction; they also linked with the three hierarchical levels of perception as follows:

- **Emotional responses:** Responses to product components related to beauty and visual appearance (Norman, 2004)*, these responses are translated into purchasing intentions, and it may be temporary satisfaction.

- **Behavioral responses:** Associated with a particular focus on product features, they

are present in expectations, the product, the consumer experience, etc. (Giese, 2000); and they may last for a longer time.

▪ **Reflective responses:** Occur at a particular time such as after consumption or after product choice, and are based on accumulated experiences and previous impressions (Oliver, 1980).

The focus here will be on those three phases of responses as well as on designing for emotions that control every individual phase, in order to shape a positive and complete emotional experience. This research also concentrates on designing to accommodate all users' responses from the first impression based on product appearance, to the responses created during product experience. All these phases of responses will be positively structured to link between the past, present, and future phases related to the user-product relationship.

3.9.2. Dynamic Appearance and Dynamic Architecture

Product appearance that communicates with the user is meant to help consumers to assess the product on functional, aesthetic, symbolic, or ergonomic levels, which play a role in the overall product appraisal (Blijlevens, 2009). Therefore, appearance should keep users connected to their products since it is the main factor in purchase decision, and this appearance should be upgradeable to keep users attracted to and in communication with their products. This will be pleasurable for users who own and use these products especially those products with long-term usage, and the same for designers by feeling positively having their task successfully achieved (Jordan, 2003). Appearance should not only attract users visually through emotional connection to encourage their purchase of the product, but also maintain users connection to these products for as longer experience as possible. However, there are many cases for appearance importance and its role in attracting users, not temporarily attraction rather lasting one because of its dynamic and renewable appearance, some of these examples are in architecture will be illustrated as follows:

▪ **Rotating Towers:** Dynamic architecture involves the fourth dimensions: Time, and the concept of dynamic architecture was first introduced by David Fisher (Christensen, 2007).

The Rotating Skyscraper takes on shapes imposed by time and life, never appearing the same in any two given moments. Some of these dynamic buildings exist as concepts, like the 80-story "Dynamic Tower" in Dubai, UAE (The Telegraph, 2008), and some older buildings such as the rotating restaurant in the top of the CN Tower in

Canada, or the one in the top cylinder of the World Trade Center Building in Mexico City, which were created to attract tourists. Perhaps the goal of designing these buildings was to address environmental concerns or addressing possibly monotonous everyday work and stress by periodically changing the interior and exterior view, or addressing other functional purposes, as with the George P. Coleman Bridge with its rotating structure which allows a path for ships (Kozel, 2004).

Futuristic projects of dynamic buildings represent a new revolution in the world of architecture; they all aim at re-shaping the cities, as the cities following a dynamic approach will change the skyline in an innovative way in the future. Companies working on this approach intend to change the concept of experiencing architecture as product. Nevertheless, in one way or another, rotating building can help its inhabitants to accommodate their emotions through the changeable interior/exterior view along their everyday life. Also, such buildings play visually emotional role for the people, those users of the building visual exterior, who watch from outside and feel these dynamic exterior changes.

- **Dynamic Facade "Kiefer Technic Showroom":** Kiefer Technic Showroom is an office building and exhibition space with a dynamic facade that changes to outdoor conditions, optimizing internal climate, while allowing users to personalize their own spaces with user controls (Vinnitskaya, 2010).

    "As if performing a dance, these facades are a gift to the eyes during a possibly boring and usual day" (Altman, 2011).

    "Kiefer Technic Showroom" is more likely to be called 'Architecture in Motion'. Kiefer Technic (Fig. 3-2) was created by architect Giselbrecht and Partner ZT GmbH in Bad Gleichenberg, Austria.

- **Rotating House:** The house owner thinks that this rotating house is perfect for entertaining and personal enjoyment; no longer will you need to decide which room will have a great view and which one will have a minimal or no view at all! [1]. This is the main concept of designing Al, and Johnstone rotating house in San Diego, U.S.A., is to maximum enjoyment without becoming bored from the sight outside the house.

These dynamic building have been designed for continuous change in order to cope with more advanced needs which can deeply impact the inhabitants performance inside these buildings, or users to whom these buildings can be visually usable.

1] http://www.rotatinghome.com

Fig. 3-2: Three different forms of the façade along three different daytimes

In other words, whoever uses these buildings, from inside or outside, dynamic and adaption are new features created for higher level of functionality, usability, and emotionality as well.

3.10. Target Group Users and Loyalty

"Knowing one's audience" (i.e., to whom the design is and by whom it will be used), is of primary importance in emotional design (Aumer-Ryan, 2005). Naturally, by clearly identifying target audiences, it becomes easier to capture someone's attention because their needs and goals are front and central (Evans, 2013). The reality is that target groups (end users) are considered when creating new products or further developing an existing one. Companies start brainstorming what those specific consumers (who have different emotional needs, attitudes, and goals) may need and use to make their lives easier or more enjoyable with a product. Targeting a specific audience or customer group can be determined by several characteristics depending on the design and its intended purpose and/or intended users. Therefore, product design and marketing teams consider the age and gender that will be most interested in making a purchase (Desmet, 2007).

It is important to earn the trust and loyalty of a specific target group, this makes it easier to convince the same audience to purchase these products or services in the future, because there is already an existing relationship between the products and those users to work with (Bowen, 1998). This research will work on positive development of the user-product relation, not only by previously determined target users, but also by involving them in the entire design and evaluation processes of these products, and then following up on their emotional changes after purchase to inhibit any negative emotions, or to accommodate them in case negative changes have already arisen.

3.11.   Co-Design Process

As already mentioned, the user-based approach relies on considering the user as co-creator with the designer. Furthermore, consulting users about their needs in this co-design process is another feature of this process. Users' involvement at particular times during the design process should be taken into account as well as involving them during requirements gathering and usability testing (Abras, 2004). However, what does co-design as a concept mean? In addition, why co-design was applied as users' involvement method in the design process? Co-design can be defined as participatory design, because co-design is an updated form of participatory design, which is related to democracy and values of democratization in design (Gregory, 2003, Sanders, 2008). Co-design means to work with people by giving them some tools and ways to reveal their view of what they would want a product or service to be (Melonio, 2013), and this perspective is appropriate to achieve the intended goals of this process. This can provide invaluable insights in the process of seeking design solutions, in spite of the existence of other concepts in the field of user involvement in the design process. In this process, designers deliver options and alternatives not necessarily meant to be a solution, but rather to elicit a response from the users to figure out the root cause of the design problem. Table (3-1) illustrates the different concepts - such as co-creation, participatory design, human-centered design, user-centered design design-in-use, and democracy design – that are related to the user partnership with the designer in the design process.

Human-centered design (HCD) approach according to the ISO standard 13407 (ISO-13407 1999) is a multidisciplinary activity, which incorporates human factors and ergonomics knowledge and techniques to enhance effectiveness and productivity, while improving human working conitions (Kesseler & Knapen, 2006). The User-centered design (UCD) is a design philosophy where the end-user's needs, wants and limitations are a focus at all stages within the design process and development lifecycle (Abras, Maloney-Krichmar, & Preece, 2004). Products developed using the UCD methodology are optimized for end-users and emphasis is placed on how the end-users need or want to use a product instead of forcing on the end user to change his behavior to use the product. UCD focuses on usability issues (Norman D. A., 1988), as the end user can use and evaluate the product through task analysis and prototyping (Kujala, 2003). The need to involve the actual users should be in the environment where they would use the product being designed (Abras, Maloney-Krichmar, & Preece, 2004). The focus is on the thing being designed (e.g., the object, service, etc.), and looking for ways to ensure

that it meets the needs and goals of the user, while the designer is being guided by the users and translate their needs and goals into reality (Staffer, 2007). However, the HCD and UCD have some similarities that can be explored as follows:

- It is quite costly and takes time to gather data from and about users and the environment where they would experience the product.
- It requires human and financial resources.
- The team includes persons from different disciplines such as psychologists and sociologists.
- The need to involve the actual users should be in the environment where they would use the product being designed (Abras, Maloney-Krichmar, & Preece, 2004).

	Similarities	Definition & Main Focus	Method, Tools, and Techniques for participation
Co-design and Co-creation Approach	The customer as contributor to quality, satisfaction and value, and Customers may not care that they have increased the productivity of the organization through their participation, but they probably do care a great deal about whether their needs are fulfilled (Bitner & others, 1997). There is no need to involve the actual users in the environment where they would use the product being designed, rather in any other places where the design process may take place. In other words, in co-design, co-creation design, and particpatory, the	Refers to collective creativity as it is applied across the whole span of a design process. It provides invaluable insight and hence co-design session can be used in development process in each phase from requirements collection until the evaluation of the product (Sanders & Stappers, 2008).	-**Method:** Work group and carrying out activities. Also it is a formation of work groups that carry out many of the activities of the project and workshops are frequently arranged for wider participation (Kensing & Blomberg, 1998). -**Tools:** written materials such as surveys, questionnaires or interviews, collages, cognitive and context mapping, storyboards, inspiration cards, modeling, workshops and prototyping. -**Techniques:** open ended (contextual) interviews or information from questionnaires, and participant observations by using audio or video recordings.
		Any act of collective creativity that is experienced jointly by two or more people (Sanders & Simons, 2009). It can also be defined as a form of marketing strategy or business strategy that emphasizes the generation and ongoing realization of mutual firm-customer value.	
Participatory design Approach		Developing solutions with the persons by considering them as project partners, since they are the true experts of everyday life experience (Melonio, 2013). Participatory design (PD) also is a set of theories, practices, and studies related to end-users as full participants in activities leading to software and hardware computer products and computer-based	

	user is co-designer.	activities (Kensing & Blomberg, 1998).	
Design-in-Use Approach		Design-in-use approach is mainly focused on professional designers who are interested in creating partnerships and collaborative alliances, as well as involving users as designers. Design-in-use refers to ways in which users take over existing products according to personal needs, and practices beyond product design. It involves emergence of unanticipated uses, and transformations in the structure and characteristics of the product (Nelson, Buisine, & Aoussat, 2003).	**Method:** analyzing operators' activities: hot-line assistance and knowledge base appropriation and interviews with the participants (Folcher, 2003). **Tools:** Prototypes and Models. **Techniques:** Direct involvement in the design process through brainstorming sessions.
Common Features that supported choosing co-design	-A continuing dialogue between designer and participants/users group. - Work with people by giving them some tools and ways to reveal their view of what they would want a product or service to be (Melonio, 2013). - Listening and engagement to innovate and create new value with customers (Bhalla, 2011). -Treating the usage phase as a source to inform human-centered design (Bredies, 2008) - Personal needs and requirements of the customers/users are better understood, served, and satisfaction enhanced (Dong, Evans, & Zou, 2008). -They are "design language" for users in addition to designers -Building realistic expectations in target groups.		

Table 3-1: The difference and similarities between the different approaches and common features supported applying co-design approach

Accordingly, and because all these concepts have common features, as they all refer to any action of collective creativity, one of these approaches –co-design- have been used to involve users as co-designers in the design process of their product.

3.11.1. Co-Design and Emotional Decision Making

People without emotions, according to a study by Damasio´s, are often unable to choose between alternatives, especially if each choice appears equally valid (Damasio, 2009). When users meet the design in the stores for the first time, it may surprise them, either pleasantly or unpleasantly. When users are involved in the entire design process and have their emotional needs considered from the early exploration phase until evaluation, it will ensure that they

have the opportunity - at least- to avoid any unpleasant surprises. However, the relation between our emotional system and responses can be stated as:

"Emotional system is also tightly coupled with behavior, preparing the body to respond appropriately to given situation" (Norman, 2004)

Therefore, users' participation in the design process will stimulate their emotional system to accept the design they co-designed, which in turn will represent a special emotional pleasure with these products (Bredies, 2008). Because users have explored their emotional needs to be used as a base for this design process where these emotional needs were transformed from mere expectations into tangible reality. Reactions are a part of experiencing emotions which the users literally try to feel and explore. Emotions allow us to make quick decisions about the world or events around us. Emotional reactions to a situation or an object are, however, stimulated before the cognitive assessment of this situation (Norman, 2004), which shows that logic and cognitive assessment is preceded by emotional assessment; therefore, emotions control decision making.

Now, the question is: How can the users' decision be oriented to repurchase the product by influencing their emotional system? The way to control user's emotions or positively directing them is 1) by offering users an opportunity to co-design their own products (Bredies, 2008), and 2) offering them the chance to re-configure the product during its lifetime. All these options are based on a product that fulfills users' emotional requirements, which cannot be created without user and designer partnership. Generally, every designer who is aiming at successful design should use the power of the emotional content that can be attached to this design and the emotional system of his targeted users (Prahalad, 2004). The co-design process can facilitate achieving this task, because it represents an uncomplicated means of designer-user communication in a design informational system (Derks, 2008). Moreover, co-design processes are one of the most recent approaches that have been created as a scientific way to explore users' needs in depth to make sure they will have a positive attitude towards products even before their production. Effectively applying user involvement in exploring, developing, and finalizing the final solution to their design problem is the main concept and principle of designer-user partnership in the design process. Again, co-design is a process that asks users to define their problems with products, as well as to understand the process of delivering the final solution (Prahalad, 2004). However, when users have been involved in / co-designed the design of a product, their perception, then, is based on the feeling of their suggestions have been taken into consideration during the process (Abras, Maloney-Krichmar, & Preece, 2004).

This leads to a sense of ownership for the final product that results in higher level of users' emotional satisfaction (Preece, 1994, 2007). Therefore, user interactions will result in product purchases in the near future. These purchases are an advantage for the designer as well as the advantage of the fulfillment of users' emotional needs, since those needs were used as the basis of the design process in order to present them with an easier and more enjoyable experience.

3.12. Mass Customization

Mass Customization (MC) is a business strategy that involves customers in the development process of a product or service to address individual needs (Kamali, 2002). It is a better way to meet customer needs and satisfaction (Qian, 2009). Likewise, Frank Piller (Piller, 2010) defined mass customization as developing, producing, marketing, and delivering affordable customized goods, and services with enough variety that nearly everyone finds exactly what she or he wants.

Also, "A product can be defined as customized when at least one of the operational activities of design, fabrication, assembly, or distribution is carried out according to the customer's specifications" (Coletti, 2011). Mass customization is the use of flexible computer-aided manufacturing systems that explore user's individual needs and apply the results to mass production efficiency to produce custom output (Kaplan, 2006). However, there is a relation between mass customization and co-design approach that can be illustrated according to the nature of the mass customized products, the phase where they have been customized, and the purpose of this customization. Each product is customized for a particular customer who is purchasing it (Rhodes, 2008).

Therefore, mass customization can be located at one end of the co-design spectrum, because the end goals of mass customization are intertwined with co-design (Piller F., 2004 & 2010). In spite of what we might often think of as co-design, the individual customer has no impact on the product for others, whereas the individual customer through the mass customization process is adopting and modifying a new product to match his needs –as much as possible - and any other customer who has the same attitudes (Duray, 2011). It means, the more customers mass customize products for the same features according to their similar needs, the more these products spread to become a recognized and familiar production line among users. This is about co-creating the users own product with the designer/brand to deliver a customized individual version.

In other words, co-design is about involving a particular group within the same user category for whom this design will be created (Prahalad, 2004). Those users who participate in the design process in order to explore their needs during the design process, and this takes place before design features are created or the product is produced. Mass customization, on the other hand, is about exploring individual customer needs after the design has already been produced to customize the existing features according to the individual desires and needs (Piller & Tseng, 2010), to match - as much as possible - the functional/emotional needs of the individual. Both co-design and mass customization do, however, focus on maximizing user satisfaction and fulfilling users' relevant different needs within specific limitations, manufacturing guidelines, and according to designer's thoughts.

3.12.1. Mass Customization and Co-Design: Communication Means

Mass customization provides an attractive business proposition to add value by directly addressing customer needs (Piller & Tseng, 2010). In this way, firms communicate with customers to co-create certain elements of their products or more fundamental aspects of the product itself in an advanced development phase (Rhodes, 2008).

Co-design and mass customization include activities like conveying information through the exchange of thoughts, messages, or information, by speech, visuals, signals, writing, or behavior. These activities such as collages in co-design elicit discussion of the intangible feelings and emotions (Melonio, 2013) and are considered as direct or indirect methods used in communication. This is exactly the relation that ought to be present between the designer and the user through the involved emotional content in the design as a sent message, to be perceived from the recipients who are in this case the users. This kind of communication can be considered, however, a touch point between – in this case- the designer and the user directly without third party, which increases the efficiency and designer's response of translating users' needs into reality. Furthermore, the most important environment to create communication is in the commonality between the parties (Wilson, 2007).

At the same time, users try to express their needs, with emotional content represented by wishes and expectations, to the designer, in a two-way communication process. But how can designers send messages while the recipient is still unspecified? Co-design is the most efficient way to determine the recipients of the designer's involved emotional content; designers should specify the target group- for whom this design is going to be created or by

whom it will be used (Sanders & Stappers, 2008). To do so, an emotional customization process is used - during the design process as well as after purchase - to deliver and explore users' emotional needs in order to be taken into designer's consideration.

3.12.2. Mass Customization From an Emotional Perspective

To provide consumers the opportunity to re-configure their own products is the main idea that mass customization is built on. There are many case studies and much literature representing mass customization models and computer aided applications. These models and applications have been already created to give consumers the chance to modify and then order their customized products after they have already purchased (Duray, 2011). A few years ago, Burger King ran a very successful campaign; they enabled their customers to customize their sandwiches to their liking (Pine, 1993). Other companies, such as "Left Shoes", DELL for computers, and Citibank, among others, with mass customization and internet based systems have provided a well-executed strategy to explore new products that have been created by the consumers' participation and customization (Marsh, 2007). Unfortunately, these products have been customized after their design components are already configured and produced, without any participation of their targeted users, especially during the design process.

Consumers had to choose from existing alternatives of available design components to come closer to meeting their needs. Also, these product designs and their alternative components had no specific target users or even specific emotional requirements; they are simply for all types and categories of users. These products have been designed only according to the designer's thoughts, expertise, and knowledge in the field of design. They may represent investments of time, effort, and money for designers and producers, while they will probably fail (Kaplan, Schoder, & Haenlein, 2007), especially during the experience time where users' emotions may shift from positive to negative ones. Accordingly, mass customization is to customize products used for evoking some of users happiness in the form of choosing from already produced components, but how about being consulted in customizing their design components and alternatives during the design process to address a wider range of positive emotions?

Mass customization can be seen as one way to deepen the relationship with existing products (Kaplan & Haenlein, 2006), while it could also be used to deepen the designer-product-user relationship by exploring users' emotional needs in an earlier phase of this relation, and even after purchasing the product and throughout the experience with it. The classical way of using

a mass customization strategy is based on giving the users a chance to customize their products, ordering them, taking them to the work-place, and experiencing them, but what if they get bored from these products due to them not being designed for their emotions? Mass customization focuses on users' needs at the time of purchase, while ignoring their emotional needs when they negatively affected during their experience time. Mass customization and co-design can be combined to increase their effectiveness and efficiency to result in an advanced level of pleasurable products from the early designing phase until products have been experienced, accordingly offering the users a higher level of an overall emotional satisfaction.

3.12.3. Mass Customization in Furniture Design

Mass customization aims at satisfying individual customer needs while staying near mass production efficiency (Pine, 1993). The field of furniture has seen many attempts at mass customization already, and many companies tried to figure out an ideal way to offer their customers enjoyable experiences with products. Ikea, one of the most well-known furniture companies, offered users a web-based tool called "Evolvex Designer" meant to make customizing cabinetry easier.

Once the customer has finished choosing her/ his favorable parts, these parts are put together with one click for shipping and the whole process takes 2-3 weeks (Fig. 3-3). Furthermore, *BoConcept* is an international retail-oriented Danish company, with a coordinated product range comprising design furniture and lifestyle products for private homes. This company's concept is to meet customers' needs by offering them customized furniture (Qian, 2009). Others include *Poliform,* which specializes in limited furniture and interior design solutions, and *Flou,* which specializes in beds and bedrooms, two Italian companies that have applied a mass customization strategy to furniture.

They have built an advanced customization system based on a very effective configurator. This configurator gives customers the possibility to combine many possible choices in a guided process that can be performed on the internet before going to the shop, or at the point of sale, where configurators are directly linked to the production line (Qian, 2009). This means they are not produced but they have already been designed, and the result of not considering the target users emotional needs is the same. Likewise, many studies have confirmed that mass customized furniture gives producers, who are close to customers, a sustainable competitive advantage (Lihra, 2008), and that they represent an interaction between customers and these companies.

1. Select template (a desired furniture to start designing it)

2. Adding or removing parts

3. Changing colors

4. Trying design in its real usage environment

5. Saving design, calculating costs and payment, ordering product

Fig. 3-3: IKEA (Evolvex Designer) Furniture Mass Customization Strategy

An advantage of a customized product could be considered as the designer's advantage, but how about the advantages to the users themselves and their emotional requirements which need to be fully met? This question is an indicator of the importance of providing the users the ability to customize their design components and alternatives in the design phase rather than after purchase.

3.12.4. Criticism to Mass Customization

Mass customization with furniture products is successfully used, but it still limited in the phase and the way it has been applied as well as limited to specific types of furniture such as

surface furniture or cabinets. In addition, the Ikea Evolvex Designer application, for example, depends on the user's knowledge about the technical contracture of furniture and how furniture parts are connected to each other. Moreover, mass customized furniture does not deal with users' psychological mood when it has been changed while users are experiencing the product that required more flexibility and advanced timing features related to these applications usage. Likewise, some companies are specialized in particular kinds of furniture; these products, however, are designed based on designers emotions and creation expertise, not on exploration of users emotional needs or feedback about their previous experiences, negative or positive. Therefore, the need to emotionally customization according to users' needs and offering them pleasurable customized designs and products should be taken into designers account. This represents a strategy that can be applied by extending product customization, at least the customization of the visual appearance, throughout the users experience with the product to accommodate their psychological changes or their work-place interior design.

Chapter 4 covers some more of the thesis literature in the field of design and design components. It is an introduction to the suggested strategy- its definition, procedures, and some ways to move towards users having their products designed for them to being designed with them. This chapter also focuses on the way to use this particular strategy to meet users' expectations. Chapter 4 outlines two levels of the research strategy: the first level is concerned with extending product emotional lifetime, and the second is about providing users with emotional recovery through designing products that are aesthetically upgradeable during the user's experience with them.

Moreover, this chapter focuses on the purchase process as well as on the emotional and other relevant motivations such as negative emotions that may arise during experience with the product. This chapter focuses on how to strengthen the mutual trust between the designer, product, and users, to create designer-user responsible cooperation that will contribute to the product's emotional success.

Chapter 4

Emotionally Durable Design and Emotion Role in the Repurchase Process

4.1. Design Strategy: Definition and Procedures

Design strategy is an expression used to describe a list of actions of designers or planning groups, or a high level plan to achieve one or more goals (Hsu, 2012). Design strategy is used for transferring ideas into a final design/product under conditions of uncertainty but without confusion (Saad, 1991). On the way to design strategy determination in general, there are important procedures required, they include:

▪   Framing the problem with its real size.

      ▪   Creating a product roadmap that allows designer/developers to attain the design goals.

Referring to the first procedure, it means problem evaluation to figure out, explore, and apply the appropriate solution, because without this evaluation, producing solutions might be more difficult (Mayer, 1992). Likewise, in order to create a product roadmap that enables designers/decision makers to reach design goals, there must be an obvious determination for these goals. Users have their own individual emotional requirements; they need to be explored through an effective method that can be used to fulfill these requirements. To do so, an investigation about users' emotional needs and expectations should be accurately done. Also, users have their own specifications for their products, such as being created to accommodate changes in their feelings during their experience with these products. In addition, there is a common target for both designers and users, which is successful product. To be successful, these products should attract and interest users for longer time and meet their emotional needs to be more successful than those do not (Desmet, 2007). However, traditional design methods are those mainly used in observational research (Maxwell, 1992), while traditional market research primarily considers what people say and think through using surveys, questionnaires, or interviews to know people's thoughts (Melonio, 2013).

The main goal of this research is to structure a design process outline based on a particular systematic strategy that aims at generating an emotional product and evoking particular positive emotions as well as inhibiting or accommodating negative ones. The suggested three-phase strategy was designed for extending user-product positive relation from the time of purchase to the experience of the products, and this strategy has its own procedures and tools. Generally, and as intended overall target, it aims at providing users long term positive experience. The structure of this strategy focuses on the entire user-product relation and consists of obtaining users' feedback and opinions about products they have already

experienced, following users' changeable moods and emotional status during the products usage lifetime, and finally providing them aesthetically upgradeable products to accommodate emotional changes throughout their experience, which in turn leads to a higher level of emotional satisfaction. But, how to ensure the user this level of satisfaction through meeting his expectations? The answer of this question can be illustrated as follows:

The definition of satisfaction according to the **I**nternational **S**tandards **O**rganization "ISO" is the level of comfort that the user feels when using a product and how acceptable this product is (Jordan, 2003). At the same time, expectations can be many things varying from wishes to hopes, and they represent an important part of the satisfaction process when they have been met. In addition, satisfaction depends not only on the quality of products, but also on what the targeted person expects from these products (Güngör, 2007). Thus, in light of the above, this may establish for a practical and systematic method which can be used to gain users' satisfaction through meeting their expectations. Furthermore, future anticipation is based on prior experience, current circumstances, or other sources of information which together shape users next experience.

Therefore, users should urge the designer to be more aware and familiar with all aspects related to user-product previous experience to constitute the next one positively. This is an emotional time-linking between users' expectations which are always positive, and users' previous experiences, which are independent, to provide them emotionally positive experience and thereby reach a higher level of user emotional satisfaction. This linking can be accomplished by considering users' co-design partnership, users' evaluation of the product, and following up on the user-product relation, as sequential but contiguous experience phases. It is about crossing from mere expectations to a real emotional product that evokes users' positive emotions and provides them more satisfaction than competing products.

4.2. Between Designers Knowledge & Users Viewpoint

Every time designers start a new creative process, they may have to make their decision about choosing between injecting design with their own experience, emotions, expertise, and knowledge, or focusing more on users' emotional needs. In the first choice, they will express and reflect their feelings on the output design, while in the second choice; they may be neutral and focus on users' emotional needs, desires, and expectations to motivate those users to purchase as a reflection of their satisfaction and loyalty. This is one of the most confusing decisions designers are forced to make before they start designing products (Bourion, 2005).

In fact, there is no contradiction between these two choices, as it might seem. Using a particular design method based on a user involvement strategy – from the very beginning of the design process - may help in eliminating this confusion.

The suggested design method and its strategy aim at addressing users' emotions and fulfilling their needs by involving them in the design process as design partners, but within the designer's expertise in the field of creation and under his supervision. However, in this research, a design process has been developed and tested to bring about this balance and eliminate what seems to be conflict between designers' emotions and users' emotional needs. Generally, this designer-user emotional cooperation during the design process has a deeper meaning represented in distributing the responsibility of making the right decision and creating more suitable design solutions, as well as sharing the responsibility of the design success between the designer and the user, and thereby the extension of product emotional lifetime to make them emotionally durable.

4.3. Designing for Product Lifetime: Understanding and Importance

In recent years, 25% of vacuum cleaners, 60 % of stereos, and even 90% of computers still function when people get rid of them (Chapman, 2005). Therefore, the United States Environmental Protection Agency (EPA) has made efforts to conserve resources; they usually focus on a well-known trio of actions: "Reduce, Reuse, and Recycle." Between reducing the amount of waste generated and reusing products, the concept of increasing product lifetime comes up (Hertwich, 2002). Extending product lifetime is one source of "reduction," that can be included in any change in the design or any use of the materials. On the other hand, many users discard a lot of products before these products are physically damaged (Chapman, 2005). The reason for the replacement of these products can be found in their design which may be out of fashion, or they may be inappropriate to changing circumstances, including psychological shifts in mood in everyday life.

From the emotional design perspective, extending product lifetime means keeping users connected to their products for as long as possible. These products have been designed with those users' participation throughout the entire design and evaluation process. Although the environmental viewpoint places great importance on product lifecycle extension, the emotional perspective has a higher priority according to this research. Product lifetime can be broken down into two types such as physical lifetime, and value lifetime (Umeda, 2005). The

focus here will be on a strategy that estimates the emotional value of a product's lifetime by looking at extending both physical and emotional value. This extension can be accomplished by including upgradeable components in the design that can be incorporated into the product while users are experiencing it, which in turn will help extending the entire emotional lifetime of the product. Emotional value can be attached to these products to extend the emotional lifetime in the form of user participation in the design and evaluation process of these products. Thereafter, to complete the image of this emotional value, users will be enabled to change their products visual appearance aesthetically to match their changeable mood and/or their dynamic emotions in various situations.

4.3.1. Design for Product Lifetime: Usage Phase Extension

About 315 million PCs, 90% of which were still functioning, were scrapped in 2004, while the number of cell phones discarded in 2005 was 100 million (Slade, 2006). In addition, there is a strong relationship between extending product lifetime usage and its entire lifetime (Fig. 4-1). However, the actual time span for each phase of production depends on various factors such as the industry, product, the brand, and the craftiness of management, and some companies and brands remain in the third phase of the product life cycle, the brand, for 50 years, while others don't survive for even six months (Staff, 2009). Each product life cycle has specific stages from resources to landfill, which are dependent to many factors, including users themselves, the way of usage, and materials used in these products. A Mini Disk player takes about 500 years to degrade fully before slowly returning back to the earth's cycles, whereas its disused cassette-playing predecessors require only 5-6 years to return into landfill after leaving the production line which represents a short life time for such a durable object (Chapman, 2005).

Resources ⇒ Raw Materials ⇒ Manufacturing ⇒ Usage ⇒ Landfill
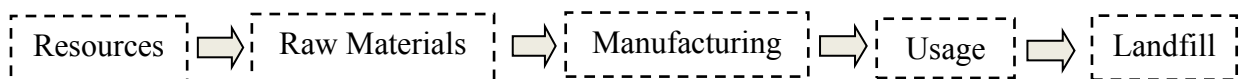
Fig. 4-1: The Product's Cycle: from Resource to Landfill

This cycle is associated with the physical value of product lifetime extension because of the unspecified duration of some products. Usage time is one of the main components of every product lifetime; both physical and emotional values depend upon it. Therefore, extending the usage phase by including both these values means the entire product lifetime can be extended, preferably with emotional content and pleasurability as well. Therefore, producing for lifetime

extension can be modeled by providing alternatives to some or all of the product's parts. This extension can be used to delay and/or decrease the frequency of product replacement, minimizing negative environmental impacts (Wilhelm, 2012). At the same time, extending product lifetime with emotional value such as emotionally and aesthetically upgradeable features and components may lead to extending and strengthening the product-user connection, and thereby increasing the emotional quality of the users' experience with these products as well.

4.3.2. Product Lifetime Extension: Strategies & Methods

Companies may release a new product when they know that all products undergo a certain lifecycle. Before reaching the end of these product lifecycles, companies must decide the next step: retire the product altogether, or extend its lifetime through a number of strategies (Lorette, 2013). Re-branding and expanding the market for the product to a broader audience are two strategies that can be used to extend product lifetime (Ellwood, 2006). These strategies depend on every individual product and market needs. However, adding value by involving personal meaning or attaching new emotional features to an existing product is one of the most effective techniques used as a re-branding strategy to extend product lifetimes before they begin to decline (Riley, 2012).

Changing the total appearance of the product can be another re-branding strategy (Davis, 2012). Therefore, the focus of this research will be on extending product lifetimes by using a re-branding strategy, but as a personal task for the users to accomplish by themselves by upgrading their product's appearance aesthetically during their experience with it and according to their preferences. Furthermore, this research focuses not only on targeting a broader user base (Taber, 2009), but also ensuring the loyalty of the present users and offering both a higher level of satisfaction. Moreover, knowledge about product life cycle can provide valuable insight into the ways a product can be managed to enhance profitability (Jaruzelski, 2013). It is therefore necessary to clarify the agreed upon view of the method used in extending product lifetime, this extension can be accomplished by various ways (Autodesk, 2012), such as (Fig. 4-2):

- Making products more physically durable.
- Giving products a new life through repair or upgrade, and;
- Including recyclable product elements, this way supports sustainability.

Accordingly, giving products new life is not necessarily achieved by re-producing the entire product,

but rather giving its elements the chance to survive- at least aesthetically and emotionally.

This does not mean ignoring physical durability; as many products are disposed while still functioning.
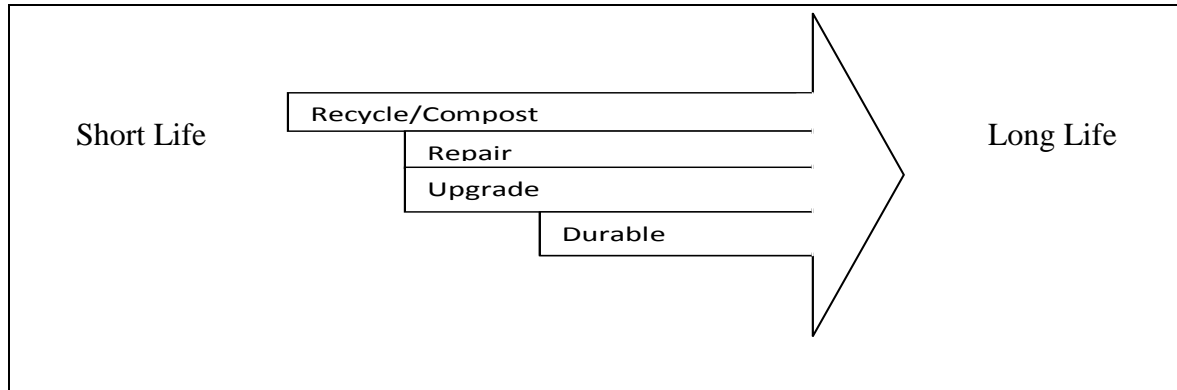

Fig. 4-2: Upgradeable product elements during product lifetime means its durability extension

As a result, to extend a product lifetime, the suggested three-phase strategy that can be applied includes two phases related to the design process, and the third is focused on the user experience phase. This strategy can be illustrated as follows:

- **Connecting users emotionally to their products twice**: This phase relates to sequential stages in the design process itself, from the very beginning until the end, including the co-design process. The first time users are connected emotionally to the product is when they co-design it. The second time is when they are given the opportunity to evaluate and modify the design in the advanced phase of the design process and before production, in addition to re-configuring the product after purchase by using mass customization, and then;

- **Extending the durability and the product's lifetime:** As the focus in this phase will be on the experience time by re-designing the product's appearance visually and aesthetically whenever and wherever they desire during their experience with it. For example, to match their interior design changes.

It's about offering users the opportunity to upgrade the product components aesthetically and emotionally during the use lifetime of the product. In other words, to design for emotionally durable products to provide users' pleasurable experiences will in turn ensure that the product has a longer lifetime. This three-phase strategy used in extending product emotional lifetimes may help users to keep their products for longer than before and ensure that they have positive

experiences as well.

4.3.3. Product Lifetime Extension & The Three Design Aspects

Referring to Donald Norman's definition of expressive behavior in emotional design (which is the external sign for an experienced emotion), Norman mentioned three design related aspects which are visceral, behavioral, and reflective design (Fig. 4-3). They are linked to each other and associated with three levels of perception as well (Norman, 2004). These three aspects are also related to product lifetime as follows:

- **Visceral design:** Concerned with product appearance and how we feel when we see the product at the time of purchase, it is related to the first impression and decision making.

- **Behavioral design:** The matter of pleasure and ease of use during the product experience, and how usable, accessible, and functional the product is.

- **Reflective design:** Considers the rationalization and intellectualization of a product while thinking about the next purchase, and the meaning reflected from the previously experienced product in users' memories.
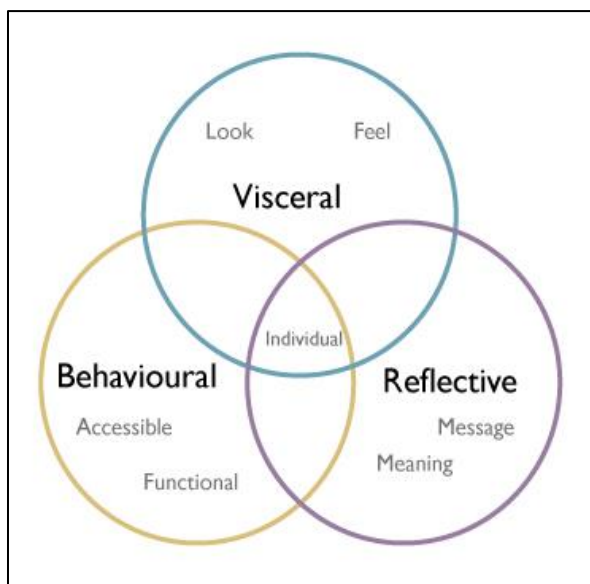
Fig. 4-3: Norman's "Visceral, behavioral, and reflective" diagram

These three phases of user experience with products can be used as a sequential guideline and tool for orienting users' decision making processes toward repurchase specific products. Designing for visceral and reflective design relates directly to the entire purchase process. As the first aspect, visceral design focuses on introducing products to users, whereas reflective design represents previous experience, including users' evaluation. These two aspects, visceral and reflective, control the entire purchase process in a continuous thinking loop. Furthermore, reflective design provides logical thinking and reasons upon which users' base their decision to repurchase or purchase a new product.

Designing for the visceral level is about orienting users' first impression to be positive or negative depending on many factors such as the feedback formulated as a result of the previous (reflective) experience (Amic, 2008). The decision will be oriented toward repurchase when the overall feedback is positive, whereas negative experience and negative feedback will motivate them to purchase a new product. On the other hand, behavioral design is the practical link and intermediate stage between the two emotional-logical phases: emotional thinking is related to the first impression and appearance at the visceral level, and decision making at the reflective one (Norman, 2004). Regarding these three aspects and phases together, the designer can control the entire purchase process and user-product relation, and thereby orient users' decision toward repurchase. Accordingly, and in light of this analysis, these three aspects of design can be used in establishing product lifetime extension, and extending every individual phase related to each design aspect represents an extension for the entire duration of experience, which consists of the sum of them all.

4.3.4. Stylistic Product Lifetime Extension

Style is about the manner of doing, the design in a particular form, the overall look, or simply about how day-to-day objects look. Style as a medium of symbolic communication is one key to product lifetime extension by using an unspecified style. The design will be timeless when its style is not restricted to a particular time, a design that will never go out of date or become unfashionable (Aaron, 2011). This means designing for individuality and stylistic durability.

The way to design for an unspecified time is to design for rapid changes in the user's lifestyle or emotion affected by their lifestyle. This will - at least - neutralize users' impressions and reactions to neither reject nor accept product time features when it is difficult for the designer to orient them emotionally to accept the product. As some users are connected emotionally to the past and features they are familiar with, others are connected to anything related to modernity (Norman, 2004).

The suggested design in this research, however, has an aesthetically dynamic appearance. This appearance can be changed by rotating or folding some components to alternate its colors, forms, textures, etc. to provide users with time-flexible designs with various style options to obtain the satisfaction of a wider range of users.

Therefore, in order to earn user satisfaction resulting from time/style orientation, designers should avoid what may evoke users' negative feelings or reactions because of time/style features in short/long term usage. Users have stated that they appreciate the designer who can

offer new solutions for old objects (Chang, 2007), and timeless design is the smooth and flexible pathway from the past to the future through an emotionally unspecified style with aesthetic and visual flexibility.

4.4. The Concept of Upgrading Products During Lifetime Usage

Now, it is necessary to clarify in depth the concept of designing upgradeable products. "Most of the spectacular new designs for home appliances fail at fitting into the lifestyles of ordinary people, people who do not live in designer homes" (Norman, 2004). Likewise, most users are searching for individuality and personal meaning in their products, so: How about offering those users the chance to upgrade their products during its lifetime to infuse them with personal meaning? Upgrading the elements and visual appearance of a product design can be done by assembling/disassembling or rotating particular elements, to change its color, form, or texture. As there are multi-purpose products, like furniture, that were created to cope with users new usability requirements, this research is attempting to establish a diverse, aesthetic product appearance to cope with users new emotional needs as well. This new feature will allow users to interact positively with their products during their product experience.

Re-designing or re-configuring products will not take place after the product has been purchased and by using mass customization applications, since users' emotions are almost stable at this time (Jordan, 2003). Rather, users will be offered an emotionally customizable product by means of its features and at any time they want, especially when negative emotions have been raised, and throughout long-term experience. Upgrading products aesthetically has another function because people have slightly different roles, while they are producers in working hours; they are mainly consumers in their free time. Therefore, people may benefit from their consumed free time to turn it into enjoyable production time by upgrading their products aesthetically during their lifetime to represent pleasurable consuming time (Rahinel, 2012). These products will protect users from being worried about their changeable psychological status wherever they use these products, and whenever their moods or even lifestyles change.

4.4.1. Upgradeable Emotional Design for Sustainable Communication

Sustainability means bringing together low impact and high quality, thereby extending products lifetime usage. However, sustainability has many aspects in many spheres, including environmental, social, and economic; accordingly its definition is relevant when designing for

product lifetime extension (Ikerd, 2007). In this research, however, the focus is to create emotionally durable products with an extended emotional value for longer, more enjoyable, stronger, and more positive communication, and to reflect this positivity on users experience and social relations. A "good design" is not just beautiful or fashionable, but must be identical and consistent in creating social belonging (Esslinger, 2006). Therefore, emotionally upgradeable products may establish a socially sustainable communication concept. Furthermore, sustainable products, from the environmental perspective, are physically durable products, which means more damage resistant to reduce the negative impact on the environment (Giudice, 2002, Waste Reform Division, 2010), whereas the intention in this research is to increase the emotional quality of these products and their relation with users (Chapman, 2005). On the other hand, from a social viewpoint, users can exchange the undesirable alternative, for any reason, with others within the same group of product owners or users. This will strengthen and extend the social communication among the users experiencing the same product, and is the most cost-effective communication solution (Carlson, 2006). Therefore, possessing an emotional product with elements that can be upgraded during its lifetime generates environmental, social, and economic advantages, for example:

- Products that stay in use for many years often have lower environmental impacts (Bordass, 2003), and durability here means not only being physically robust, however, staying emotionally is relevant as well.

- Some material expenses will be reduced due to condensing of the production cycle.
  These products will remain in the usage phase for a longer time; accordingly, production will focus on the alternatives/elements, which will be made from recyclable materials, instead of reproducing the whole product.

- Saving production time and money on rejected products to which their users were not attracted because these products could not address their emotions (Creusen, 2005).

- Giving the product a longer lifetime, appearance renewability, emotionally durable content (Chapman, 2005), and finally communicative emotional value, may help in accommodating and appropriating a larger number of attitudes in the users' everyday life.

So designing products that can be assessed and adapted according to users' emotional dynamic states stimulates a positive emotional interaction with these products. This conveys personal meaning to every individual user (Burnette, 1994).

4.4.2.   Upgradeable Design Against Complexity

Technology is mostly translated into high cost (Frenken, 2006)*;* therefore, designing with technological simplicity, low cost, and interactive applications may evoke users' positive emotional responses. Also, the tendency towards increased usage of technological complexity stimulates development of less interesting products (Desmet, 2009). Simplicity of design is included in this research, and has been achieved through development of the design method, its strategy, and its application design. This method is used to design products that create a simple user-product interaction that can recover users' positive emotions or accommodate their negative ones, without technological complications. Designing interaction with simplicity in mind refers here to non-digital or non-electronic products to ensure their users more satisfying and emotional experiences. These products are manual and have emotional interactive features such as rotating elements, regardless of the different manufacturing details or technical method of this rotation, and other folding elements, with open and closed options, by which the user can change her or his product appearance. These features with their technological simplicity may take the experience with interactive products into different level where interaction is emotional and time-flexible to match users' psychological, emotional, and decorative changes.

4.5. General Reasons of Repurchasing

Purchase reasoning is rooted in emotion, not logic; it may not seem reasonable, intelligent, or even practical to the buyer or many other people (Chitwood, 2004). Nevertheless, this reasoning reflects what is important to the buyer (customer, user, and purchaser), who bases their decision on personal factors such as desire of gain or pride of ownership. Furthermore, there are various sources that motivate the purchasing process. They are external or behavioral, and these motivations emerge from direct stimulus or from pleasant/unpleasant factors (Bardakci, 2003)*,* including;

- Social, arisen from the imitation of models or group behaviors;
- Biological, arisen from senses and physical stimulation;
- Cognitive, arisen from interests or curiosity, problem solving, or decision making;
- Affective (Emotional), arisen from personal feelings, self-esteem, or enthusiasm;
- Conative, arisen from long term goals or control over one's own destiny;
- Spiritual, arisen from personal purposes or relation to the unknown.

These motivations control users' purchase processes and force the buyer to purchase as quickly as possible. Manning (Manning, 2004) described a triangular purchase-decision-making relation that has been illustrated in Table (4-1). According to Manning's purchase motives, there are two factors related indirectly to emotional experience and perception which are brand reputation and personal

recommendations, whereas the third focuses directly on emotional criteria. Customers have needs related to functionality, usability, as well as emotionality, and designers or companies translate product features into benefits, because people buy benefits not features (Elliott, 2009).

Aspect	Organizational Buyer	End User (Buyer)
Purpose of purchase	Organizational use/benefit or resale (by 'distributor')	*Personal use/benefit*
Buyer	Often a group	Individual
Purchase factors	Product specifications Technical factors Rational criteria	Brand reputation Personal recommendations *Emotional criteria*
Decision time	Often lengthy	*Usually quick*
Alternative situations	1- First-time 2-Straight rebuy 3-Modified rebuy	4-Habitual, low cost, experiential 5-Variety seeking 6-Complex, high cost

Table 4-1: The most known reasons and motives controlling end-users/ buyers repurchase process (Manning & Reece, 2004)

Likewise, products have particular features and benefits. As product benefits link product features and customer needs, while emotional features link using products - with or without pleasure - and the next purchase. Customer needs can be satisfied by translating features of product into benefits (Chapman, 2005), especially those associated with addressing customers positive emotional responses and providing satisfying experiences. Accordingly, emotions play an important role, if not the main role, in the purchase process and decision making. According to Table (4-1), emotional motivations represent about one third of the total mentioned motives of users purchase process. Therefore, the design process has been developed to positively and pleasurably extend the user-product relation for as long as possible, without raising negative emotions which may delay the product purchase process.

4.6. Positive/Negative Emotions and Repurchase

Emotions have particular effects on us, whether negative or positive, and products not only evoke basic affective response such as like and dislike, but also stimulate and provoke negative and/or positive emotions such as boredom, interest, attraction, fun, and trust (Demir, 2008). These different emotions and their ability to influence and shape user-product relations and experience, illustrate the importance of concentrating on them, the way they have been raised, and their role in motivating users' next purchase process, as the effect of these emotions depends on their psychological, rather than moral, nature. Positive emotions can

translate into a user's positive evaluation of the product, repurchase as a reflection of user satisfaction, and pleasant memories and feelings resulting from a users' positive experience (Ben-Zeév, 2010).

Meanwhile, negative emotions have the opposite effect, such as product rejection or ignorance, unpleasant memories and feelings, or the user's negative evaluation of the product and the experience as well. Therefore, the next few sections will focus on specific positive and negative emotions and their impact on user-product relations and experience in order to determine how to evoke positive emotions and benefit their influence in orienting the user to repurchase, as well as using their extended positive impact to strengthen the user-product relation. In parallel is how to prevent negative emotions from being provoked, or at least how to accommodate them when they arise.

4.6.1. Boredom as Negative Emotion

The term boredom does not refer to a basic emotion (Plutchick, 1980), but a prototypical one, which includes the clearest exemplars of emotion that most people consider (Russell, 1989, 1999). Boredom is an example that illustrates several psychological meanings such as re-orientation, an affective state, a kind of feeling, and a certain type of mood (Slaby, 2010). Experiencing boredom as negative emotional state is associated with a wide range of social and psychological problems. In order to understand these problems, boredom is related to the negative experience of dissatisfaction and/or dislike, thereby related to the absence of interest, and associated sometimes with attraction.

Therefore, a psychologically deeper understanding of boredom will facilitate reaching typical emotional ways to overcome it. In addition, a bored person is also an individual who has not acquired the basic ability to fill her/his own time (Svendsen, 2005). Although the main components of boredom are a monotonous environment and constraints, experiencing boredom depends on motives of becoming bored (LePera, 2011) which could be internal or external, psychological or social. Accordingly, products that have no features to draw users' attention and interest will be isolated and disliked after a short period of usage. Furthermore, on Plutchik's wheel of emotions boredom lies on the same side as disgust and on the opposite side of trust.

Boredom is a complex feeling made up from blending adjacent emotions such as disgust and sadness or because of the absence of trust and joy (Parker, 2007). This negative emotion can be evoked by experiencing products for a long time, which in turn, may stimulate a desire of

disposing of them. This means, in order to protect users from experiencing boredom with or because of a product, it is necessary to concentrate on two parallel processes relevant to long-term usage, they are **a**) designing products with features that provide users an emotionally and aesthetically renewable user-product connection, and **b**) strengthening designer-product-user mutual trust to form and positively affect user experiences with the product, thereby ensuring their loyalty (Shneiderman, 1992). Moreover, once users are involved in their products' design process and evaluation, it will facilitate the designer's task of fulfilling users' emotional needs by obtaining verbal or nonverbal expressive feedback directly from them and exploring what made them bored during their previous experience.

Boredom with products has its reasons and therefore its particular emotional treatment that can be illustrated according to a full exploration and understanding of this negative emotion and the way users experience it with their products. "Silent fog" is the way Heidegger labeled boredom (Menick, 2005). This research focuses mainly on inhibiting being bored with something the products, in this case, and accommodating these negative emotions when they have arisen. Boredom with products may be experienced because the product cannot fulfill what users expected from it, leaving us somehow emotionally empty (Slaby, 2010). Experiencing boredom during product usage can have many reasons, such as:

- Lack of attention and awareness to outside stimuli, or having difficulties paying attention to thoughts/feelings as internal information. Both are required to participate in satisfying activities, thereby avoiding boredom (Fenske, 2012).

- Long-term usage of products without engaging in an interesting activity.

- Changes in stimulation are one of the most common reasons for boredom, as product experience becomes static with no fun and/or interesting content, users will soon find themselves confronted with unbearable boredom (Svendsen, 2005).

- Attraction, interesting features, and renewing positive experiences are all matters of product perception related to boredom. These features control users' behaviors which in turn motivates them to prefer one product over another (Desmet, 2007).

In order to protect users from experiencing boredom and its negative impact during experience with products, some or all of the following solutions may be applied:

1. Inhibiting activities that routinely fill users' regular experience with products, and providing them with a creative experience full of emotionally dynamic content instead.

2. Creating attentiveness in this experience, to keep users connected to and fascinated with products (Slaby, 2010).

3. Creating products for mindfulness, by making users involved in a moment-to-moment awareness with these products one way or another (LePera, 2011).

These suggestions are valid when the designer intends to inhibit this negative emotion from being stimulated through his design. In case it is evoked, creating products with renewable, interesting features and with a visually and aesthetically upgradeable appearance to enable users to recover their positive emotions which controlled their purchase, thus combatting boredom.

4.6.2. Boredom, Disgust, and Repurchasing

Referring again to Plutchik's wheel of emotions and focusing on boredom and disgust as negative emotions, the relation between them, their various stimuli, and the outcome of behavioral reactions resulting from experiencing them, how can these emotions be linked with the repurchasing process? Actually, Robert Plutchik maintains that the closer to one another those basic emotions lie on the wheel (Fig. 4-4), the more they have in common (Parker, 2007). This means dislike, revulsion, and aversion have much in common with disgust and boredom. In addition, Plutchik classified disgust as a basic emotion with distinct behavioral, cognitive, and physiological dimensions (Olatunji, 2007), while boredom is a derivative emotion that results from blending adjacent basic emotions, like disgust and sadness. This confirms that disgust and boredom have stimuli in common, and that they also have similar reactions present in object or event rejection (Plutchick, 1980).

Moreover, boredom results from a lack of attention (Harris, 2000), whereas disgust, according to its behavioral component, is distancing oneself from the elicitor of disgust and thus rejection of that object. This refers to the sequence of boredom as a lack of attention followed by disgusting the object that elicited boredom which means rejecting it. However, product rejection is the final reaction that any designer would like to avoid from the user for whom this product has been designed. Rejection, disgust, boredom, and/or lack of attention are all negative reactions or responses which motivate users to look for another product that provides them with positive experience and evokes positive emotions.
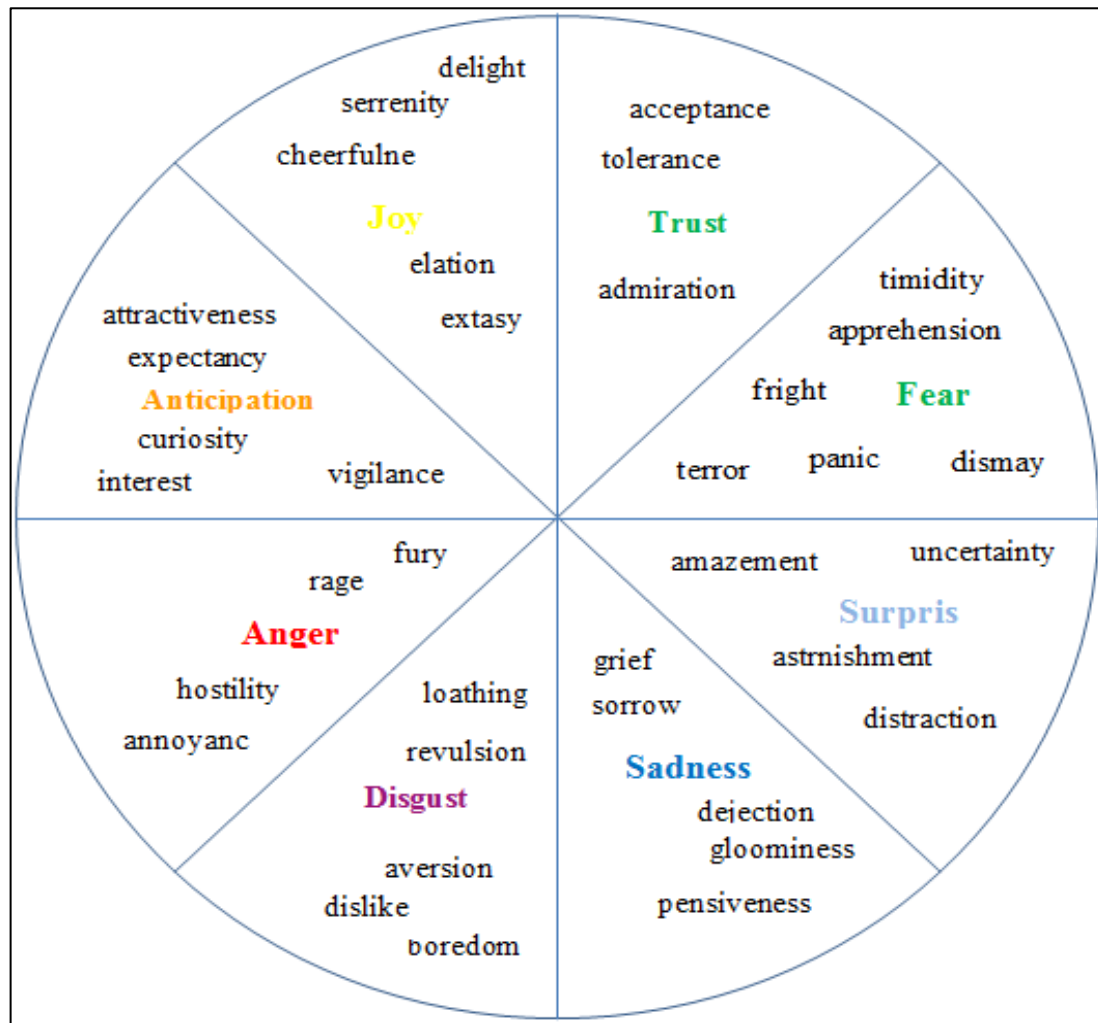
Fig. 4-4: Robert Plutchik's Wheel of Emotions (Drews, 2007)

4.6.3. Trust/Distrust and Repurchasing

Distrust is a reflection of a truster's expectation of the trustee's poor capabilities and negative motives which translate into a lack of confidence (Dimoka, 2010). There is a strong correlation between trust/distrust and emotions, or to be more specific, the way trust/distrust influences our emotions, which in turn affects our experience with products and controls our decision making process of the next purchase. In addition, trust and disgust are primary emotions, they lie opposite each other on Plutchik's wheel of emotions, and they have particular stimuli and result from different events. Trust is conceptualized as a more complex, multidimensional psychological state that includes affective and motivational components, and in terms of choice, trust shows that decisions are observable behaviors and have their own advantage (Kramer, 1999, McKnight, 2001). Distrust is defined as a "lack of confidence" in the other, whatever the other might be (Grovier, 1994). As a result, trust or distrust of

someone or something, in this case the designer as well as the design, is derived from fulfillment or neglect of users' expectation of a positive effect on their emotions by accomplishing a specific task or experience with the design. Trust will be constituted when product features meet users' expectations, fulfill their needs, and thereby guide users to repurchase. Similarly, distrust is when this product cannot fulfill these expectations and/or evokes negative emotions; accordingly it will motivate users to purchase another product.

Furthermore, trust/distrust is a dynamic emotion. It can increase with positive experience on the long term, and decrease with negative one (Ries, 2006). Therefore, over time and during users' experience with a product, when trust is supported users will feel their expectations have been and are still being met, and that the designer offered them an emotionally dynamic design that copes with their dynamic trust and constantly evolving experience. Once the designer can design to accommodate users' dynamic trust, he will ensure those users' loyalty, because he accommodated one of the most influential factors in choosing to purchase a new product or to repurchase the previously experienced one. At the same time, users trust in the product that inhibited their negative emotion will be maximized; which in turn, will reflect positively on user satisfaction, loyalty, and chances of repurchasing.

4.6.4. Interest, Boredom, and Repurchasing: Perceptual Perspective

"Objects capable of sustaining long-lasting relationships with consumers are rare, and most emotional attachments are withdrawn once the honeymoon period draws to a close"

This is how Jonathan Chapman (Chapman, 2005) described the state of the early stages of a subject–object relationship. In this period while the product is still new, users are still influenced by several factors such as consumption interest, the product-user relation still being discovered, testing expectations, and finally, the effect of the positive first impression at the purchase time which then motivated the user to purchase and is still in effect to some extent. The time of discovery quickly ends, and this means the beginning of the end of the user-product relation of functionality and usability, as users nowadays are short-distance runners (Chapman, 2005) to start the emotional one. This user-product emotional relation will rely on the positive and negative emotions provoked because of using or experiencing the product. Afterwards, the decline in attention, if it has begun, will be translated into boredom after the user's interest at the time of purchase declines, and becomes a symptom of the failure of this relationship, or simply a result of dissatisfaction and negative experience.

Dissatisfaction with products must be rooted to understand the motivation underlying post purchase behavior, as user satisfaction with products leads to repeat purchases and the acceptance of other products in the same product line (Hausknecht, 1988). This means users will prefer products that draw their attention to increase and extend interest and attraction beyond the moment of purchase, not those products with temporary attraction and interest used in persuading them to purchase. Repurchase intention is affected directly by the negative feedback resulting from any negative emotions evoked as well as from previous negative experience, and together they shape the overall impression and lead to dissatisfaction, whereas positive emotions reflect users satisfaction and indirectly indicate repurchase intent (Güngör, 2007). Furthermore, almost everyone experiences boredom, but some people experience boredom much more frequently, because they might need more excitement from life (Gosline, 2011).

Accordingly, boredom, as negative emotion is related directly to perception, and boredom is not merely an inherent property of circumstances; it is rather a subjective perception rooted in certain aspects of consciousness (Iso-Ahola & Weissinger, 1990). Negative emotions such as boredom, affect the user repurchase process just as much as interest, trust, and attraction do, which underscores the necessity of designing to provide users with an interesting experience with products for as long as possible, in order to keep them protected from unbearable boredom (Svendsen, 2005). Considering the dynamic psychological mode that formulates users' everyday life (Ancona, 1975), what is interesting to users at one moment may not be at another (Norman, 2004), and can change as users shift their preference from wanting to repurchase to wanting to purchase another product that draws their attention and interest. However, insofar as users' previous experience was negative, they will consciously orient towards another product, as they are more likely to enjoy positive experiences and make repeat purchases only when they experience positive emotions as a result of consumption (Chitturi, 2009).

Chapter 5 outlines a three-stage application of the developed emotional design method and the main strategy, tools, and stimuli used to create an emotional product with specific features. This emotional product also evokes particular positive emotions, as well as inhibiting or accommodating any negative emotions. This approach and strategy is used as an application for translating the previous three chapters of theoretical literature and background related to the field of emotions and perception into practice.

Chapter 5 is the overall structure of the suggested method and is based on specifying a target group of users who will be involved in developing and evaluating a product, and for whom this product will be designed. Afterwards, some tools such as a questionnaire, a computer-aided tool (video), and a mass customization application have been used to present this product (in this case, a coffee table design concept) to the participants, as well as to address users' expectations and to incorporate their evaluation in a co-design process. The developed design process outline focuses on three phases relevant to user-product experience, two phases focus on the design process, while the third focuses on the post purchase phase.

The Developed Method of an Emotional Product: Strategy, Application, and Tools

5.1. Emotional Design Process Development: An Introduction

The "first impression" is the key to controlling a user's purchase choice; it is the decisive factor of whether they will purchase a product or continue searching in the stores. Donald Norman's three hierarchical levels of perception and Plutchik's wheel of emotions (Parker, 2007), have been used together as qualitative-quantitative methodology, to develop the design process to result in an emotionally pleasing product. Furthermore, this method has been used to provide users with aesthetically and emotionally dynamic products that enable them to recover the positive feelings that influenced and oriented their decision to purchase. An application's outline structure, in this chapter, has been designed and used to be the exploration of this methodology. This outline is based on identifying emotional design characteristics after specifying users' target group and their emotional needs, and then fulfilling these needs by involving users in the product design and evaluation process. This is to ensure a user's positive first impression with pleasant surprises at the moment of purchase, and then extending this pleasure as long as possible throughout their experience of these products (Naqvi, 2006). This part of the research focuses also on the "know-how" of customizing user's emotional needs in a co-design process to increase the likelihood of a stronger and more lasting positive user-product experience, without the user becoming bored, to offer users higher level of emotional satisfaction. User involvement in the design process is not new to the field of design; in fact, many design methods have been structured to require users to play a part, but users are often confused about their role and concerned about their lack of expertise in the field of design. Moreover, designers –most of time- are creators and play the main role in design process; they have the required experience to design while users don't. However, in light of these facts, it is important to make some utilitarian tradeoffs between the designer and the user (Chitturi, 2009), since they have a common object, which is the product, and a common goal, which is the success of this product.

At the same time, users provide the designer with information about their needs and expectations, as well as providing him with the most important component for increasing the design quality of the product's' next generation. This component is the user's previous experience or overall emotional impression and evaluation, especially when this experience was negative, because negative experiences impact customer loyalty [1], as much, if not more than positive experiences do. Referring to the importance of users' involvement in the design process, designers infuse the design with their own emotions which dominated them during design process, but these are not enough to ensure design success

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[1] According to Right Now Technologies and Harris Interactive report (2010), 87% of all consumers will never go back to an organization after a negative experience.

(Amic, 2008). This requires a design process development to result in an emotional design based on blending both user and designer emotions, and balancing between the uniqueness of designer creations without any exclusion of user emotional needs or expectations. It is important, however, to apply a developed design method or design strategy to evoke user's positive emotions. This development depends on following up on the user-product relationship and emotions during the usage lifetime to enable the user to form a positive overall evaluation of the entire experience. This two-stage user evaluation is used by the designer to evaluate realistically to what extent his design succeeded or failed at fulfilling users' emotional needs.

On the other hand, designer evaluation based on user co-design and feedback will constitute the outline of next development process, and it will be used to develop the product's emotional features to extend the positive effect and positive experience as long as possible. This chapter explains a design strategy that requires dividing the user-product relation into three sequential phases within a continuous loop; the first two phases - within the design process itself - are used as an introductory phase for the third one. The third phase is associated with and starts at the first user-product interaction at purchase time, and throughout the entire experience with the product until the next purchase process. This entails developing the design process to result in an emotional product based on a specific strategy, particular goals, sequences, tools, stimuli, and participants. Each phase will result in feedback which in turn will be used, after being analyzed, as the starting point of the next phase. It is important to mention that these three phases are directly associated with the three hierarchical levels of user perception.

5.1.1. Reasons of Choosing Furniture as an Application

Most of the authors and researchers who have written about products designed for emotions and the way to test and measure a consumer's emotional responses to them, have focused on a variety of products such as electronics or hi-tech products and household appliances. These products can affect consumers with their appearance and artificial intelligence interactions, while furniture is a non-electronic product which required an attempt to apply designing an emotional one with possibility to interact. Designing interactive furniture is new to the field of furniture design, especially with manually controlled interaction rather than complicated electronic and technological controls. Furthermore, authors and researchers have concentrated on many types of products and ignored furniture items (e.g., chairs, tables, beds) because the pleasure evoked from furniture sometimes relies more on physical ergonomic satisfaction

(Chang & Wu, 2007), whereas in this study it will rely on emotional fulfillment after isolating functionality and usability features.

Nevertheless, furniture as a product can also be chosen depending on emotional contact with regardless of functionality and usability which are widely offered. Italian furniture style, for example, is preferred by some people, whereas others prefer the Scandinavian style, such emotional responses related to attitudes are elicited by the appearance of the 'object as such' and not by an (anticipated) consequence of usage or by (expected) behavior or functioning" (Desmet, Porcelijn & van Dijk, 2007). Moreover, furniture which have a long-term usage lifetime should have the priority to be emotionally designed to evoke users' positive emotions, to inhibit their negative one, and to provide them with a positive experience on the long run. In addition, this wide range of furniture usage in general - tables for example - emphasizes the direct physical and emotional relation to users; accordingly, it is necessary to shape this relation positively. Ultimately, choosing a furniture product is merely a case study to examine how successful the design process development is in the product design field, and to benefit from the area of specialization, previous experience, and expertise of the author of this research.

5.2. Emotionally Dynamic Design Concept: Description

A coffee table (Fig. 5-1) is the design concept that has been selected for applying and then validating the developed design strategy. This strategy includes some tools such as co-design and mass-customization, used for addressing user's specific emotions. This design concept is expected to help users to overcome boredom arisen due to the long-term usage by means of an upgradeable appearance during the product usage lifetime. Coffee tables are
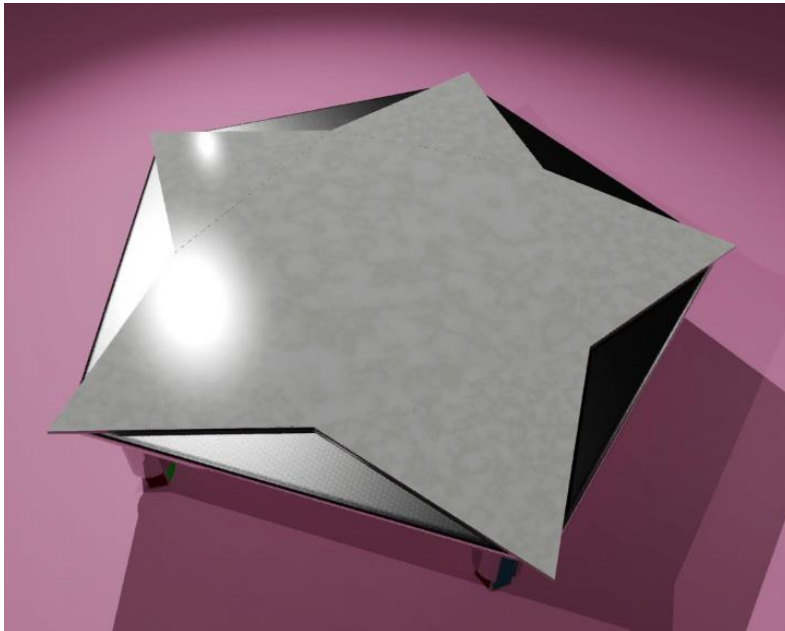
Fig. 5-1: One of the suggested forms of the coffee table emotional design

found in many work places, and they are available in many different variations in size, material, components, features, and style. The design model used in this study consists of various materials and has many options. This table design concept was created in a co-design process and its design has been customized twice by the users to stimulate positive emotions. Furthermore, this coffee table construction consists of five main components described as follows:

- **The Table Upper Surface:** The upper working surface is an additional surface laid on the main working surface to offer the user an optional, folding work place that can be opened and closed to change the outline and space of the used area. The upper surface has some alternative colors/materials/textures assigned to different shapes such as triangular, square, hexagonal, and pentagonal, these materials can differ from the outside face to the inside face (Fig. 5-2).
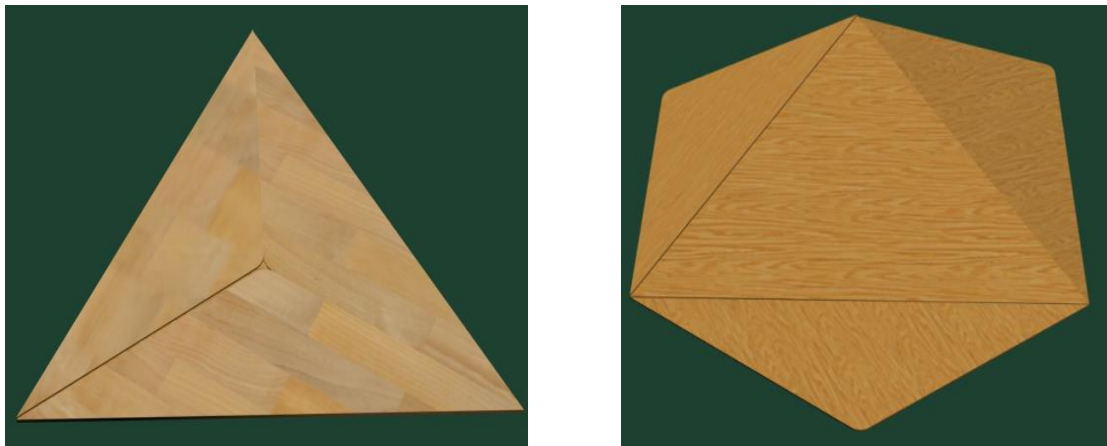
Fig. 5-2: The triangular upper-surface opened (veneer type) and closed (veneer other type)

- **Table Main Working Surface:** The main working surface is the fixed component of the coffee table; it is the most visible part of the table, in case the user decided not to purchase the upper surface. The table's main working surface has the same visual and aesthetic alternatives of the previous element, but it has only one shape which is a plain circle form.

- **The Table Leg Connectors:** This element has the same alternatives as the previous elements, and it is required to strengthen the structure of the table, and it connects between the legs in some table types or styles to give them more physical durability and a longer usage lifetime. Table leg connectors can be one of five different geometrics such as cylinder, triangle, square, pentagon, or hexagon, according to

user's choice (Fig. 5-3). The color or material that can be attached to this element depends on the number of sides or faces of its chosen form.
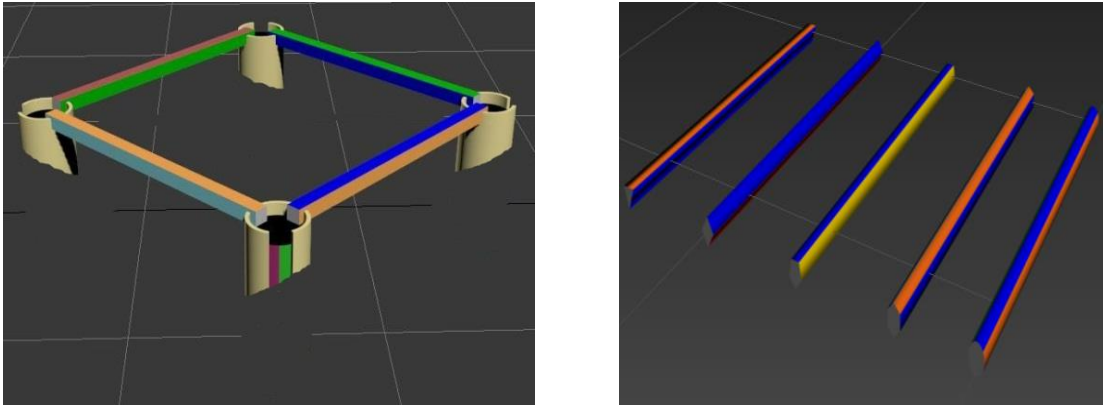
Figure 5-3: The different forms of rotating legs connectors that strengthen table's structure

▪ **The Table Legs and Legs shell:** The legs are the supportive base of tables, and they have the same options as previous elements. This component, as well as leg connectors, can be rotated manually. On the other hand, the legs shell is a fixed component that contains the axis which the table legs rotate around. It has been
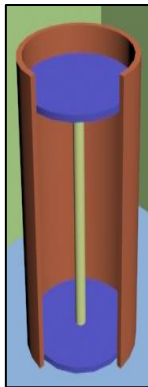
Fig. 5-4: The fixed legs shell or cover

designed (Fig. 5-4) to cover/ hide about 75%, or rather say, to show only one side/designated option of the leg's body from the open part (about 25%). All these alternatives can be applied to different components of the table, like the well-known "stud-and-tube" connection used in building toys. Users can purchase these upgrades with the table after choosing their favorite alternatives. It's important to confirm that participants will be offered this design's individual elements and their alternatives, so that they can choose the most appropriate pieces in a co-design process that starts at the early design phase of this emotional design strategy.

5.3. Emotional Design Strategy: Early Design Phase

Design is an activity associated with creativity, fantasy, and the spirit of invention and technical innovation, and it is often seen as sort of act of creation (Bürdek, 2005). Based on the three hierarchical levels of perception; visceral, behavioral, and reflective, the suggested strategy has three main phases, two of them are included within the design process, **1**) The early design phase (exploration phase) that will focus on the visceral level of perception, and

2) The advanced design phase (design) that will focus on both the visceral and reflective levels of perception. Whereas the third phase of the overall strategy phases will focus on users' emotions throughout the experience with the product until the next purchase time. This strategy's interest will be involving the user in the design process for deeper understanding of their emotional concerns - including aesthetic and perceptual - to be considered and the primary emotional needs to be explored. And then, the focus will be on the users' relation throughout the experience with the product where this relation needs to be supported to be emotionally and positively lasting as long as possible.

5.3.1. Goals and Appraisal

The main design idea was a "Coffee Table" design concept that the target group users appraise as emotionally dynamic, aesthetically upgradeable, has unexpected feature, and fit for possession. For that reason, two studies of a co-design process were performed to explore this appraisal and to highlighting the emotional concerns of the target group users. At the first study, participants have been asked to explore their thoughts in the form of choosing their favorite design components and options from a restricted degree of variability.

Respondents have chosen from the designer's pre-selected design elements and alternatives, in order to share the design process between the designer and user to ensure the designer his right to design, and to give the user the opportunity to participate. This phase focuses on achieving particular goals such as:

- Clarification: of the main design idea, its visual and aesthetic features, and the perception of its individual components.
- Exploration: of user's emotional needs and expectations.
- Specification: of the characteristics of an emotional design of the target users group.

5.3.2. Participants and Stimuli

A group of forty-two respondents (26 men, 16 women) between 19 and 34 years of age participated in this study as exemplary participants. They were all product design students (the target group) from different countries and design institutes, such as the UdK: University of Arts in Berlin, the School of Art Kassel (Kunsthochschule), and the faculty of Applied Arts in Egypt. All respondents owned and/or used coffee tables whether at their offices or homes, and they have all offered to participate as unpaid volunteers. Instead of relying on any measurement tool of emotional responses of the respondents, they can report their emotions with the

use of words. Participants carried out particular exercise which is answering a questionnaire to determine the main characteristics of an emotional design concept. This exploration study aimed at retrieving perspectives from the participants about their emotional needs in the next version of coffee tables, and specifying the importance of being designed with them in perceiving it. The stimuli that have been chosen for this phase focused on a design concept for a "coffee table" and presented to all respondents as individual elements in the form of 2D and 3D drawings. This design with its new feature is intended to address users' positive emotional responses by exciting users with its upgradeable appearance. Two additional criteria used in selection were 1) being aesthetically upgradeable should be completely new to the participants, and 2) its components should have several alternatives to choose from.

5.3.3. Tools

Respondents received an e-mailed questionnaire with different descriptions of the main design idea. The mailed questionnaire (Appendix A) with its qualitative and quantitative questions took approximately twenty minutes to complete. It aimed at –in addition to exploring participants' choices and emotional responses – expressing the reasons of their choices, and the way they perceived these design elements. Also, this questionnaire was designed to combine the benefits of qualitative and quantitative answers (Abdul Mutalib & Azizah, 2012) to attain deeper understanding, identification, and exploration of the participants' desires and thoughts. Furthermore, the questionnaire outline contained three different groups of questions that focused on three different types of data (Table 5-1). It is important to explain the advantages of using questionnaires in this strategy, these benefits are:

- Practicality especially the large amounts of information which can be collected in a short period of time and in a relatively cost effective way, in addition to flexibility to respond according to the respondent's most appropriate time.
- The results of the questionnaires can usually be quickly and easily quantified by either the use of a software package or by the researcher (Ackroyd & Hughes, 1981).
- Questionnaire can be analyzed more 'scientifically' and objectively than other research forms such as in-depth interviews (Popper, 1959).
- One of the interviews most important advantages is to obtain the facial impressions and emotional responses directly and personally which is not required in this research.
- The possibility to use the quantified data to compare and contrast other research and to be used to measure the expected change from the first, second, and third phase of the

strategy.

Group	Goals of the group	Focus of the Group
1	Focused on particular goals such as exploring users' emotional requirements, identifying the main features of the emotional design, its concept, and its individual elements and their alternatives, and finally, exploration of participants' expectations and attributes related to the design appearance.	Early design phase: for visceral and reflective level of perception.
2	Focused on some goals such as participants' opinions and criticism to the design due to their previous experience with similar products, their viewpoint about the reasons that motive them to purchase new product, and if this idea may help positively in delaying the purchase of the new one.	Advanced design phase: for reflective level of perception and pleasant surprise.
3	Focused on participants' opinions about the way this design presented to them. Also, it focused on participants' exploration about the importance of being involved in their products design, and this involvement role in perceiving the product they co-created.	Post purchase phase: for behavioral level of perception.

Table 5-1: Questionnaire's three colored groups of questions and their focus

5.3.4. Results and Data Analysis

Focusing on particular users' group "product design students" used in this phase represented an exemplary information source for the features of an emotional design, concept, and users' expectations. It is necessary to explain the reasons of choosing design student as users' group/participants (Desmet P. M., 2007). Product design students have appropriate background about the design process, and product design basics and fundamentals which will combine the advantages of being users as well as novice designers - in the future - who may benefit the resulted outcome as design as well as designing guidelines. After an individual task was completed, however, the characteristics of the table's appearance were chosen from the participants' qualitative and quantitative responses and comments. Data collected from the questionnaire were transcribed into a word processing program, and correspondence analysis was performed according to the feedback resulting from participants' answers. Participants' exploration of, expectations for, and opinions about the different features are basically related to the design appearance and the main concept from their own emotional perspective. They were also asked to explore any pleasure that may be elicited through the visual appearance of the coffee table's items and to ignore any pleasure elicited from physical interaction or performance (Chang & Wu, 2007). Among the data, many key sentences and words in

addition to the quantitative answers- were identified from the responses and provided the basis of data grouping. It was required from the participants to choose the main components of the design, select customization preferences, and to describe their previous experience with similar products and how this experience was positive or negative, and what their most basic motives for purchasing the product were. The respondents were also asked to evaluate their participation in the design process, and the impact of this involvement on their perception of the design concept which they co-design. The next few sections will describe participants' choices and their explorations resulted from their quantitative and qualitative answers. The results of this phase have been represented in:

Appearance issues: Respondents were free not only to choose their desired design elements, shapes, colors, textures, and materials, but also to suggest other choices for these elements' alternatives. The number of options has been reduced in order to prevent any confusion that might result from a large number of choices, as well as keeping the survey compact.

About **shapes** section, participants chose the square shape more than other shapes to be the upper surface, followed by the hexagonal in the second place, then pentagonal, and finally the triangle shape. Every participant selected her/his desired shape; and this selection based on some emotional and perceptual factors such as the type of line, if the lines involved in the shape matched their attitudes, and if this shape evoked certain emotions. Participants also chose the cylinder form, followed by square, triangle, hexagonal, and then pentagonal forms, as the favorite form for the legs and leg connectors. Respondents' **color** choices limited to fourteen colors, in addition to black and white (Table 5-2).

Color	White 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Others
Main Surface	50 %	21.4 %	21.4 %	7 %	21.4 %	42.9 %	14 %	7 %	7 %	14 %	7 %	28.6 %	21.4 %	14 %	28.6 %	7 %
Legs Shell	42.9%	28.6%	28.6%	15%	21.4%	42.9%	21.4%	15%	15%	7%	7%	28.6%	35.7%	15%	35.7%	15%

Table 5-2: Difference between percentage of the chosen colors for two design elements

These colors have been chosen according to the designer (researcher) - based on his personal viewpoint and experience - to represent a wider range of possible color schemes, ranging from

cold to warm. Participants were asked to rate the most desirable color, as well as rating the other colors. These sixteen colors had different rates depending on the design element the color would be applied to, and all choices relied on the participant's taste and emotional perspective. Referring to **materials** choices, they based on the relation between the way people experience products and the properties of these materials which have been also explored in the context of material selection for this coffee table design concept (Fig. 5-5).
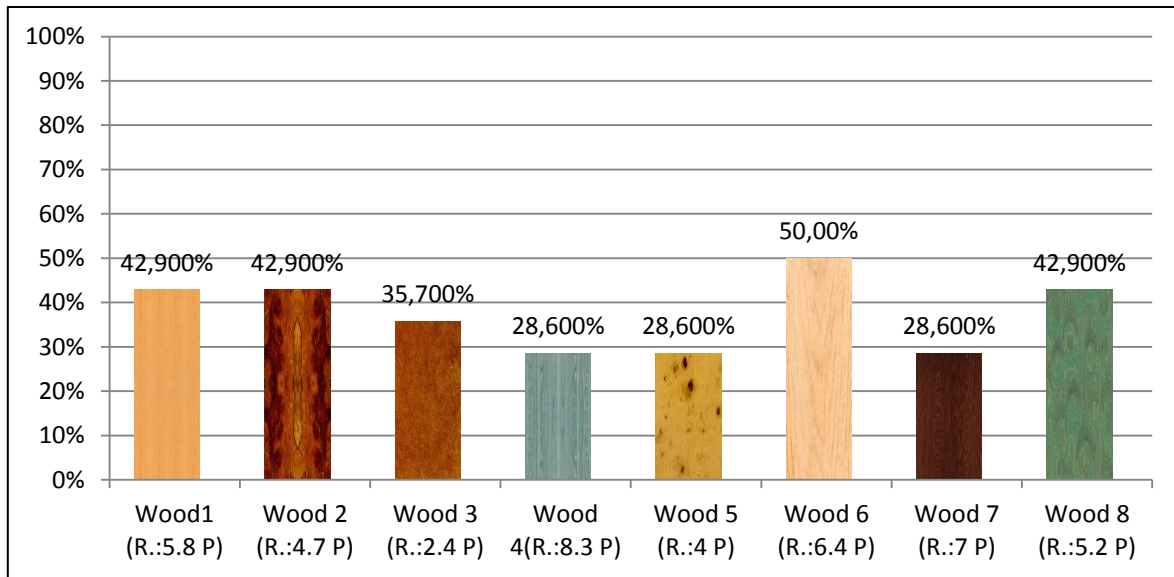
Fig. 5-5: The chosen wood samples for the table design elements and alternatives

In a survey used for exploring participants' expectations and choices, different materials in small pictures have been presented with codes rather than real names, and these chosen materials were wood, marble, metal, and leather. Eight wood pictures were rated relying on participants' emotional viewpoint, and participants rated what they were attracted to and/or liked.

Metal, Marble, and Leather were another material samples - plain color or textured – that the participants offered to rate them. Participants have rated for example these 10 metal samples as Figure (5-6) shows. It is important to emphasize that participants were able to judge the design appearance and its features separately from the other characteristics of the co-designed concept, and they approved many characteristics associated with an emotional design. Also, their opinions based on their understanding of the main design concept represented by its upgradeable appearance, not on the design's physical properties or the final product usability.
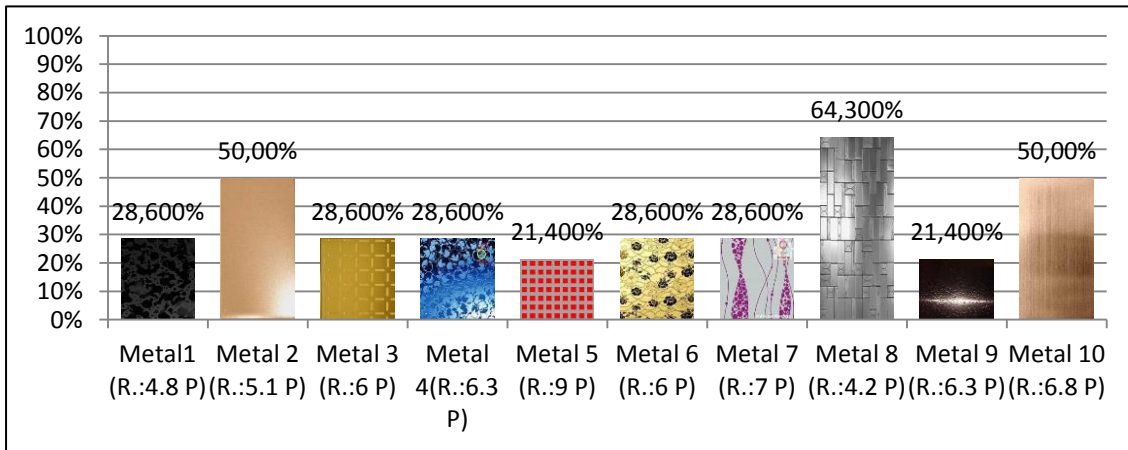
Fig. 5-6:The chosen metal samples for the table design elements and alternatives

Some of these characteristics they explored in qualitative answers and others in quantitative ones as table (5-3) illustrates, and these answers were categorized in specific criteria (Maxwell, 1992).

Type of Feature	Characteristics	Key sentences and Rating
Emotional Design Exploration	**Visual and Aesthetic Features of the Design Concept**	1-The choice of particular colors, shapes, materials, and forms to be most desirable. 2-Colors, lines, shapes, and forms mixture is required (average of 64.3%- 85.7% agreed). 3-Sense of materials 4-Appearance is attractive (imagined). 5-New combination of alternatives and materials and/or textures (71.4% agreed). 6-Installation/uninstallation of the design components is satisfying as new feature (78.6% approved). 7-Installation/uninstallation of the design components is an easy task to accomplish. 8-Shape/colors/material/Texture are "emotional design" features (92.9% agreed). 9-Design style is timeless (71.4% agreed). 10-Most remarkable combination was to integrate manual interactivity features represented by changing the position of some elements such as folding the upper surface with open and close options, and rotating others, such as legs, without technological complication.

		11-Visually or aesthetically upgradeable during its usage lifetime.
	The expected emotional needs of the final form	1-The design has unexpected application 2-Transparent materials 3-Mixture between wood and glass 4-I like abstract ornaments. 5- More texture mixture in the same material. 6-Preferred a prototype with real materials not small scale images. 7-Flexibility in changing design elements (85.7% approved), and they liked this feature. 8-Multi-functional furniture is required.
	The expected perception of the design concept in the final form	1-Flexibility in changing design elements will connect users emotionally to their products (71.4% approved). 2-Because of traditional and cultural attitudes, the size of the product should consider spaces and user define issues. 3-It will be more communicative than my last one. 4-It may not represent unpleasantly surprise unless it will represent pleasant one if it contained what I explored in the co-design session.
	Previous Experience with a coffee table	1- Not being able to participate in the design process leaving the products unable to fulfill their emotional needs, in spite of their products still functioning. 2-Being bored from the long-term usage without refreshing change of the product.
Design Process	**Users' involvement and importance of emotional needs**	1-Users should be involved in the design process of their products (92.9% agreed). 2-Users involvement in the design process of their products will result in an emotional design (71.4% approved). 3-Users' emotional needs are highly important as much as usability and functionality (78.6% approved). 4-Distinguishing between "only functional or usable" and "functional and emotional" design is by user involvement

Design Presentation	Tools	1- A video or a model is satisfactory design presentation tool (78.6% agreed). 2-A mix of qualitative and quantitative exploration of a design feature may result in more accurate descriptions for an emotional design. 3-Interviews are required in case a personal direct emotional reactions and responses. 4-To see the components of this design concept in the final form will be better in judging a product design.

Table 5-3: Demonstration of data analysis processes of the Design strategy: early design phase

The opinions of the participants relied on the flexibility in a design that can accommodate their dynamic feelings and lifestyles. They believed that the emotional quality of a design that contains this combination will improve as well as their experience quality, and they considered this feature as something new, especially in the field of furniture. The feedback that resulted has been used in introducing and preparing the second phase that focuses on the advanced phase of the design process.

5.4. Emotional Design Strategy: Advanced Design Phase

This is the second phase of the design strategy. It aims at exploring participants' opinions in the advanced design phase, and focuses on the design after it has been modified according to their choices in the first phase. In this phase, however, it was necessary to attach a new utility for more clarification about the design concept especially the motion related to some of its components. The second phase of the strategy also has particular goals, stimuli, tools, and participants.

5.4.1. Goals

The feedback and participant suggestions resulting from the early design phase were used to reach a deeper understanding and clearer conceptualization of users' emotional needs and expectations. Also, the results of the early design phase will help in determining if this design concept can generate a pleasant surprise and capture the users' first impression positively or not. According to this feedback, goals of the second phase of the strategy have been identified

in particular goals such as confirming the favorable design components and customization options the participants chose in the first phase, and to join these elements together in a final product and offer it to be edited or confirmed.

Moreover, identifying the difference between the design as individual elements and the final product from the perceptual perspective, and emphasizing the design features that have addressed positive emotional responses and whether the positive effect of these features can be extended or not. And finally, examining users' interest or ignorance of this product after it has been produced, as well as determining if it can be used to stabilize the users' emotions during the experience with it and for as long as possible. This feedback together with the pre-specified content targets of the second phase of this strategy will validate the success or failure of the two-phase design process at fulfilling users' emotional requirements until this point and show if an emotional design concept has been created.

5.4.2. Participants Stimuli, and Tools

Participants are the same who participated in the first phase with a slight change; some of the respondents could not participate in this phase and should have been replaced. The design in this phase has been presented as a final product and the stimuli consisted of showing participants some of their choices in the first phase. These designs resulted from their choices can be modified by the participants and they can see the effect of their modifications once they finished. However, the tools that were used in this phase were:

- **Questionnaire:** A second version of the questionnaire (Appendix B) which was used in the first phase, this version was meant to confirm or make further modifications to their previous choices, and it contained no drawings. The questions were divided into two colored groups with different content and focus. Each group focused on two main points (Table 5-4).

- **Word processing Program and Charts:** used for grouping, analyzing, and obtaining an exemplary representation for results of the first and second phase of the strategy.

- **Computer- aided video**: Participants received a video presenting the table design concept with more clarification about the way it works, and how its components can be installed and uninstalled to change the design visual appearance. It was difficult for them to imagine folding the upper surface or replacing its alternatives, as well as rotating the legs inside the legs shell.

Group	Goals of the Group	Focus of the Group
1	Focused on some goals such as specifying the final features of an emotional design in its final form, with complete visual relations, as well as focusing on appearance role in users' perception and design concept success. Also focused on confirming if this design concept includes any of these features or not.	Advanced Phase: 2nd phase of co-design process, visceral design, and pleasant surprise
2	Focused on other goals such as specifying participants' impressions, overall emotional responses, and expectations about possible emotions evoked because of this design concept. Moreover, it focused on participants' suggestions about the way to make the experience with this product positive, how they can be strongly connected to it, and whether they would welcome participating in its next development process.	Post Purchase Phase: Perception, behavioral and reflective design.

Table 5-4: The focus of the advanced phase questions and its relation with research goals

Mass Customization Application (Fig. 5-7)**:** Used as a utility instead of the first questionnaire's drawings, in addition to the video. This application was also used to re-configure participants' choices for design element options in the form of a final product with an immediate outcome. It has been used to customize according to participants' emotional needs in the final design phase rather than after purchasing the product.
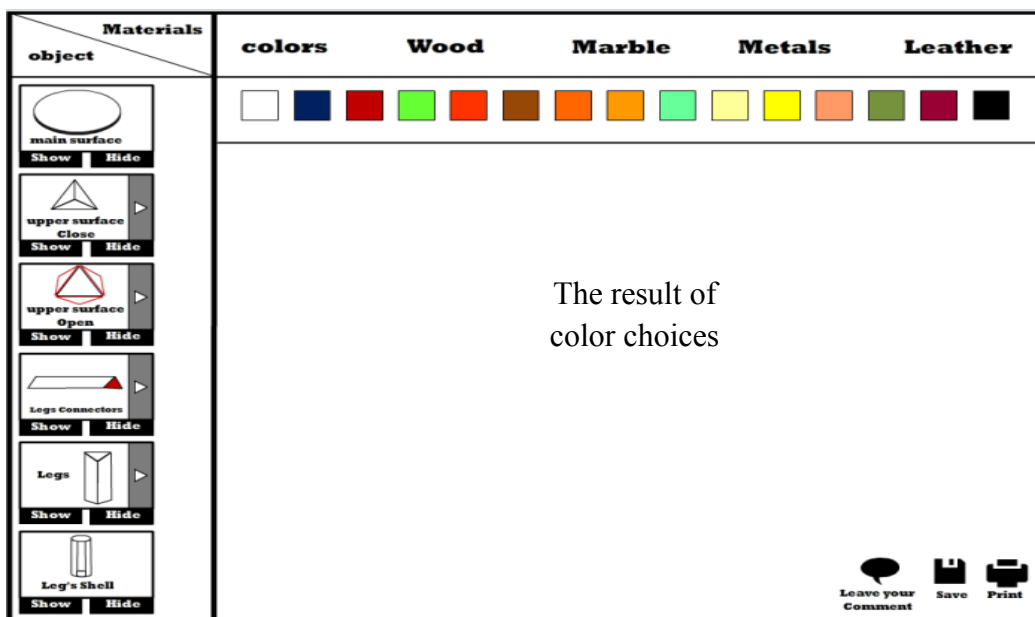
Fig. 5-7: The emotional customization application and some of its interfaces for different choices

5.4.3. Results and Data Analysis

To complete the second phase of this strategy, participants were asked for the second time about their emotional needs if they still unmet, or to confirm their fulfilled ones. They were also sent a virtual utility "A video" because this phase of the design had different content which required advanced tool for presenting the design concept. Moreover, the main design new feature related to dynamic and motion which 2D or 3D drawings are not sufficient to present it. There was some stability in participants' choices as well as some changes. The next few sections present the categorizations, the analysis, and explanation of these changes related to appearance issues such as **Color** choices which in this phase differed from those in the previous one, since participants depended more on logical thinking and an overall emotional perspective, especially in the presence of the final assembled product. In this phase, participants considered harmony or contrast between colors according to their taste, and they reported more awareness of color choices. While **Shapes** choices to design concept, however, were based on a particular technique. The video they received enabled them to re-think about their choices, especially those related to the folding surface with the open/close option. Accordingly, participants' choices, evaluation, and rating of the design elements and alternatives differed from those in the first phase. Practicability and price, for example, were among these factors (Fig. 5-8).

Square   Hexagonal
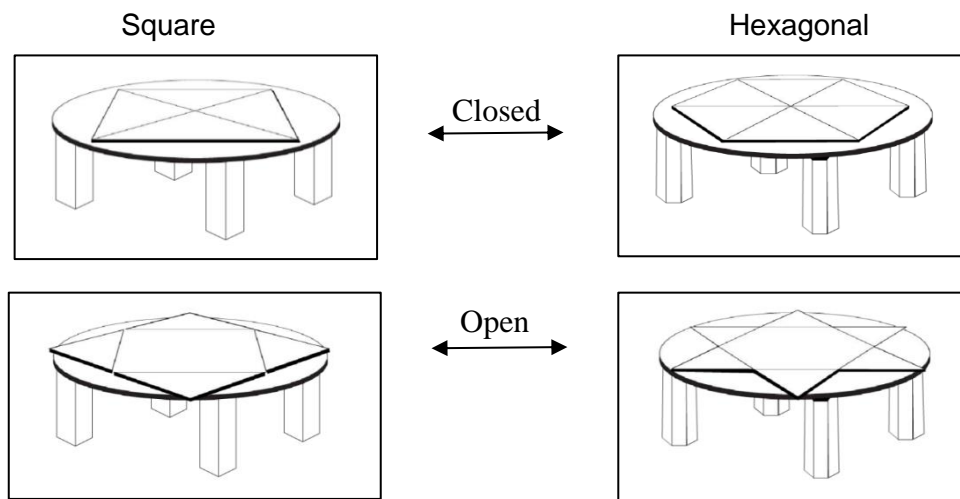
Closed

Open

Fig. 5-8: Square and Hexagonal with different perceptual perspective

The perception, logical calculation, and conception changed after watching the video since the square shape is almost similar whether in the open or closed position.

-**Forms selection** like legs and leg connectors had no extreme difference in their rates of preference, but participants tried to make some logical connections in harmonizing between

different table components. This harmony was achieved by the participants' emotional supervision, which dominated their logical thinking and choices in this phase. Respondents considered choosing the hexagonal form with 6 sides/faces to match their hexagonal upper surface and provide more possibilities for variation to cope with wider range of changes in their everyday life (Table 5-5).
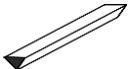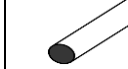
	E.	A.	E.	A.	E.	A.	E.	A.	E.	A.
Legs Connectors	Triangle		Square		Pentagonal		Hexagonal		Cylinder	
Rate (**E**: Early, **A**.: Advanced)	4.8	5.4	5.3	3.7	5.3	2	3.7	6.2	5.3	5.1

Table 5-5: Rating of the legs connectors choices in the early and advanced design phase

Some participants tried to be neutral in their choices and preferred the cylinder legs which they chose it as a neutral form for them. Therefore, the cylinder form was chosen by a high percentage of participant's among the design elements (Table 5-6).

	E.	A.	E.	A.	E.	A.	E.	A.	E.	A.
Legs	Triangle		Square		Pentagonal		Hexagonal		Cylinder	
Rate (**E**: Early, **A**.: Advanced)	3rd	4th	4th	2nd	5th	4th	1st	3rd	2nd	1st

Table 5-6: Rating of the legs choices in the early and advanced design phase

-**Materials** selection, participants also re-considered their material and texture choices, and some of them preferred combining different materials and/or textures for the final form of the design concept, while others wanted to harmonize the different options. Other participants disliked choosing materials without touching and/or smelling them, since they believed that materials can be distinguished by their physical and tactile properties. It was then clarified that all features related to usability and functionality were to be disregarded, and that the aim of this study was restricted to attributes related to design appearance. However, the first impression of the product and thereby the likelihood of a purchase being made initially depending on the product's appearance and visual communication.

At this phase, there have been many explorations, modifications, and analyses that link participants' emotional responses to the design appearance and these responses were confirmed in the second phase of this strategy. Some of these attitudes were design issues, while others were related to the next phase of user experience, product usage lifetime, and emotionality. This phase was necessary to assure the consistency of attitudes toward appearance, and to do so, tools in this phase have been adapted to encompass additional context, aiming at gathering more in-depth information about more emotional design features. Table (5-7) illustrates the same criteria that have been used in analyzing the data resulted from the early design phase such as aesthetic appearance issues, user-product expected relation and experience, and design process and design presentation method.

Type of Feature	Characteristics	Key sentences and/or Rating
Emotional Exploration and Final Design	**Visual and aesthetic features**	Most of the participants between (60% - 94%) confirmed the next group of characteristics to label a design as emotional one, and they emphasized the importance of them. An emotional design is important to have: 1- Design Image (modern, chic, classic) 2- Ambiance (nice, relaxing, comfortable). 3- Positivity (stimulates positive mood) 4-Trustworthy (stimulates confidence in designer). 5- Ability to inhibit boredom. 6- Features that surprise me pleasantly. 7- Visually comfortable shape. 8- Simple, smart, easy to perceive shape 9- Colors that should be cheerful, surprising, colorful. 10- Renewability to accommodate dynamic psychological changes. 11- Sense of material. 12- New combination translated into harmonizing contradictory items. 13- Unexpected applications such as in this design concept an upgradeable appearance during lifetime.
		1- Appearance is interesting: because it is unique, as well

	The fulfilled emotional needs	as it's a new concept and will not getting bored from it (90.5% approved). 2- It is a new design idea based on users' emotions: because its idea makes it always new (76.2% approved). Moreover, its curved lines and surfaces, its simplicity, and its dynamic design are all reasons of having a good design idea. Also, applicable, has new mechanism, and it has my favorite aesthetical features. 3- Emotionally meets my needs, and it evokes positive emotions such as (happiness, pleasure, and fun): because being always changeable and matching almost every moment in my day is the point, and I was involved in designing it (73.9% agreed). 4- It has emotional explorations strengths (Emotional advantages): because of its pretty colors, its appearance, shapes of components, simplicity and interesting concept of renewability during its lifetime. 5- I can find the options I want in the offered alternatives. 6- It is easy to make changes of alternatives exactly according to my wish and whenever needed. 7- I got my emotional expectations came true in this design idea, and it is satisfying to possession.
	Use-Product Expected relationship	1- I will be happy: because Accommodate my Psychological changes, The product with transparent material. 2- I will have self-confidence: because I feel that I have created by myself, and was created for me. 3- Secured while using it: because there are no harmful edges or sharp shapes, the ease of installation/uninstallation of its alternatives. 4- Proficiency: because all components are created carefully, for its purpose and tasks required are easy to do, and simple

	Use-Product Expected relationship	5- Not stressed during usage: because it's attractive appearance, new combinations, easy to use, and special and aesthetic colors. 6- Proud of owning it: because it is unique, has a new combination, easy to use, has something new in content. 7- User-Product relation strength: because it has something unique, meets my emotional needs. 8- Socially connective: because it connects me with others, and its renewability feature that refresh my life.
	The actual perception in the advanced design phase and expected experience.	1- They expected purchasing it as soon as it is available because the ability of changing its appearance or design anytime they wish, which may represent fun or Uniqueness when they do not buy something new for a new occasion or some other purposes or changes in their mood or decorations. 2- No necessity to live with one design appearance the whole time of experience or even buy new one, this design concept is in the middle. 3- This design is easy to understand. 4- Its components will be under control although it has not produced yet. 5- I will be able to learn how to use all that is offered in this design 6- Installing and uninstalling of components is easy to accomplish. 7- I will recommend product to yourself and others when it is available.
Design Process	**User involvement/ importance of emotional needs.**	1- First impression/reaction is positive: because this is the first time to see it after being designed although I have co-designed. 2-Most of them decided to purchase it because of being involved in it design process.

Design Presentation	Tools	1- A video or a model is satisfactory design presentation tool.
		2-Some participants are quite sure of the necessity of touching or smelling the product and feeling whether they will like or dislike them.

Table 5-7: Data analysis processes of the Design strategy: Advanced design phase

During the study, respondents watched the video demonstrating the main concept, and the mass customization application in a co-design process used for constructing the final design. Participants' choices of design appearance and elements in the advanced phase were all translated into emotional design criteria and components, which have been categorized in particular groups (Maxwell, 1992). This exploration was to determine the way they perceived the final design, and what emotions were evoked because of this design. However, the sense of user-product interaction and its importance has been explored from participants' emotional perspective. Participants' comments about negative emotions for example, referred with acceptable percentage (about 74%) that, boredom represents on average 15% of the motivation for them to purchase a new product. This percentage contains a clear indication of boredom's negative effect on the user-product relationship and purchase decisions, as well as further emphasizes the importance of designing to reduce boredom. Emotional responses elicited in the first phase of this strategy were not so different from those in the second phase, especially after most of the expected needs in the early design phase have been met in the advanced one, but the way of perceiving the design had many differences especially those related to design appearance.

5.5. Emotional Design Strategy: Post Purchase Phase

This is the last phase of the strategy which will focus on the post purchase phase and user-product relation during the experience of the product. Post-purchase is when relation has been limited to the user and the product. In this stage, users' emotions control not only the strength or weakness of their relation to the product, but also their next purchase decision. The feedback resulting from the last two phases could be considered as participants' overall positive indicator about accepting the new design concept. Moreover, the post purchase phase is about when and where a reflective meaning is being formulated, and behavior with products can be influenced by any positive or negative emotions evoked because of this product during

experience with it. Therefore, there are some activities that can be carried out in this phase to follow up on users and evaluate their experience with products, such as surveys or interviews, to gain feedback. Then, the results could be used in an analysis to go back, revise, and refine or iterate users' requirements relying on the resultant data. But how can an experience with a product concept be evaluated? There are many ways to measure the success or failure of user experience with products while still in the concept phase.

5.5.1. Post Purchase and User Evaluation

A strategy based on user involvement in their product's design process will often lead to positive responses starting from positive first impressions at purchase time, and continuing throughout the entire experience. User evaluation is an indirect way by which users are involved in the design process (Lewis & Rieman, 1994). Post purchase evaluation is a practical and realistic representation of how successful these products are in meeting users various needs, and a valuable source to determine the reasons for the success or failure of the products (Plemons, 2012). This indicates whether their experience with these products was positive or negative, and provides the designer with deeper knowledge about the design. In order to be an effective and realistic evaluation, it should consist of continuous user feedback and this feedback should inform the continuing development process by the designer.

For example, when the designer is accustomed to recognize, manage, and deal with user emotions on a regular basis, users will enjoy greater happiness, enjoyment, as well as better relationships with products (Segal, Smith, & Robinson, 2010). However, managing user's emotions with regular product evaluation during their experience is most useful to help designers identify the different emotions evoked by these products at an early stage and before users' next purchase. This will enable designers to rectify any possible problems in the design's emotional content and to orient the user towards repurchase relying on the development of this new content.

Users have their own wishes that designers should concentrate on; this is necessary to recover users' initial positive emotions. Evaluation can be used as tool for extending and restoring these positive feeling and emotions, not only to persuade users to accept and use products in their everyday lives (Buchanan, 1989), but also to support users emotional experience by recovering and extending their attention as well as extending their positive emotions that controlled them at purchase decision making. However, emotions are dynamic, and today's stimulus for a positive emotion can stimulate a negative one tomorrow. This dynamic nature

of emotions requires a special management ability that can be affected by means of user feedback and the designer's continuous analysis and evaluation of this feedback. This continuous feedback and evaluation is to find a convenient method through which designers' and users' emotional common satisfaction can be ensured at a higher level. This satisfaction will translate into users being inclined to repurchase and their loyalty will be guaranteed.

5.5.2. Post Purchase Phase: Techniques

The whole emotional design strategy aims at examining design appearance- not usability or functionality- and the role that appearance plays in consumer evaluation and purchase choice. In other words, this strategy is meant to evaluate the experiential aspects of the whole concept of an emotional design in the early phases of product development rather than the first drafts of the user interface (Creusen & Schoormans, 2005).

This examination will help in identifying how to extend the positive impact of appearance throughout user experience with the product. The third phase of the emotional design strategy utilizes certain foundations or multi-attribute techniques to evaluate the expected experience with the table emotional design concept, which are:

- Similarity-dissimilarity ranking: A historical database comparison between users' previous negative experiences and the reasons behind this negativity, and the expected experience with this design concept (von Hippel, 1983). Three versions of qualitative and quantitative questionnaires were used to conduct this comparison. Two versions have been used with the participants in the first and second phase of this strategy, while the third one was used with a wider range of users to emphasize this conduction and then validate this comparison and the whole strategy efficiency.

- Focus group method: A previous psychological study about specific users', their behavior, and reactions with products (Frost & Braine, 1967). This psychological survey has also been carried out to standardize the previous negatively affected behavior caused by tables with the positively affected one because of the emotionally designed table concept which users co-designed.

- Involving design features to provoke users' positive emotions, like attraction, which ensures better performance (Norman, 2004), pleasure, interest, trust, social relatedness, and fun, in addition to inhibiting or accommodating negative emotions like boredom by using an aesthetically and visually upgradeable design concept.

5.5.3. Goals and Tools

This last phase of the emotional design strategy has also main goals that can be summarized as follows:

- Emphasizing: the efficiency of the strategy in creating an emotional design concept.
- Emphasizing: the ability of the resulting design concept at addressing users' positive emotions and inhibiting or overcoming negative ones, increasing user trust in the product's emotional design, the possibility of being attracted positively and emotionally to it.
- Outlining: the structure of the strategy.

In this phase, three tools have been used to achieve the goals of this strategy, as well as to emphasize its efficacy. These tools are:

- The content of the second version of the questionnaire and its analysis have been used in the advanced design phase as AttrakDiff method (Hassenzahl, Burmester, & Koller, 2003) with some modifications to generate quantitative, comparative data. Participants were asked to evaluate the co-designed product on a bipolar adjective pair scale which will be analyzed at the end of this chapter.
- Word processing program and charts have been used for analyzing, comparing, and matching the results of the first and second phases, to evaluate the strategy, its sequence, and whether it has already achieved the overall goals.
- Feedback resulting from the second phase in the form of qualitative and quantitative answers and descriptions of the participants.

These are the tools that have been chosen to finalize the last phase of this strategy and assuring its goals as being planned.

5.5.4. Results and Analysis

The results in this section are not limited to the current phase; rather the entire strategy's all phases. Firstly, participants' descriptions about their feelings and reactions, whether qualitative or quantitative, have been analyzed. On average, participants made a lot of comments that illustrated their emotional viewpoints about the table emotional design concept, and indicated satisfactory success of the strategy, its structure, and its tools. Here is a summary of the results:

- Participants were able to judge design appearance separately from the other design features and characteristics.
- It would be better to present products in the form of a prototype to evaluate other types

of features that are highly important for particular users, but the way the design concept was presented – using computer-aided tools such as 3D models or videos - was satisfactory.

▪ Being not only involved in an emotional product co-design process, but also in evaluating and re-configuring it imparted a positive feeling for users participating in the research.

▪ Participants were impressed by being able to use the mass customization application to modify this product concept in its design phase to include emotional content, rather than modifying it after it had been produced and/or purchased.

The final step in this strategy was to narrow down the emotional appearance attributes from participants' descriptions according to their perception. These were the most remarkable results of this study, as there are some characteristics related to different design features such as functionality, usability, and emotional features, some of them survived until the end of this strategy (Fig. 5-9); and these will stay with the users during their experience. These features, however, were explored in light of expectations and desires that participants described in their qualitative answers according to the following sequence of the user experience with the product:

A- **At the Design Process (Early & Advanced Phase):** Some important features for the users and they explored them to label a design as an emotional one, these features such as: Design image (style), ambiance (nice or relaxing), positive, trustworthy, engaging (can help in accommodating boredom), surprising, attractive, fit (has an acceptable form), shape (simple, smart), colorful, renewable, sense of materials, functionality, usability, unique combination, unexpected application, a clear design idea, evokes a feeling of comfort, strong communicative, has consistent ratio, supports ease of use, and has a clear function.

B- Some of these characteristics have been explored with bipolar adjective pairs (for example: Color which have been approved by 64.3% of participants as harmony, and 35,7% conflicting), and other characteristics are drawn from participants' comments such as the function being obvious, easy to use, comfortable, etc. **Throughout the Purchase Process:** These features are divided into two categories:

- **The first category is the Features Previously Required for Purchasing:** These features –from the users' view point- are pre-specified as a base of the purchase process and decision making. However, they prefer this product to be

interesting, attractive, surprising, pleasing, and contain unexpected applications. These characteristics were rated and judged by describing the **"Coffee table design concept"** as being good and stimulates a positive first impression, has an attractive appearance, stimulates happiness, trustworthy appearance, and has a nice design. Moreover, about 64.3% of participants decided to purchase this product, and they estimated they would use it regularly. Boredom, as negative emotion, represents 46-60% of the purchase motive for the first group who has an intention to purchase it, whereas it represents 0-15% for the group who disliked it.

- **The second category is at Purchase Time:** Attributes associated with this design concept and a positive first impression include being interesting and having an attractive appearance, being a new design idea, evoking positive emotions, and may help in inhibiting or accommodating negative ones. At this time, users have certain interests they use in judging the product; some of them consider an attractive and appealing appearance to represent 57.1% of their motive to purchase. Other participants stated that 14.3% of their reason for purchasing this product was its visual and aesthetical appearance which is upgradeable, while other participants considered boredom with their table present version as 14.3% of their reason to purchase a new one.

C- **Issues Related to the Expected Experience with this Product Concept:** these features are focused on a variety of users' interests such as appearance which has been explored in: color, form, shape, style, and ambiance, etc. Also, trust was another interest of the participants and they explored it in some words such as: easy to understand, secure during use, self-confident, relaxed, communicative, sociable, quick in discovering its ideal performance and possible additional emotional features, meets my expectations, and proud of its uniqueness. Referring to the participants' emotional focus of interest, they prefer the product to be: Attractive, interesting, pleasing, funny, engaging (anti-boredom), emotionally or aesthetically upgradeable, meets their expectations, fulfills their emotional needs, and sophisticated.

D- And finally, they explored the usability and functionality needs that have been met in this design concept by: Installing/uninstalling alternatives is easy, easy to use, and function is obvious. Participants also explored the overall impressions about the

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expected experience with this product as they will not be bored with it; they will communicate with other users through ownership of and connection to this product, and will be thereby socially satisfied.
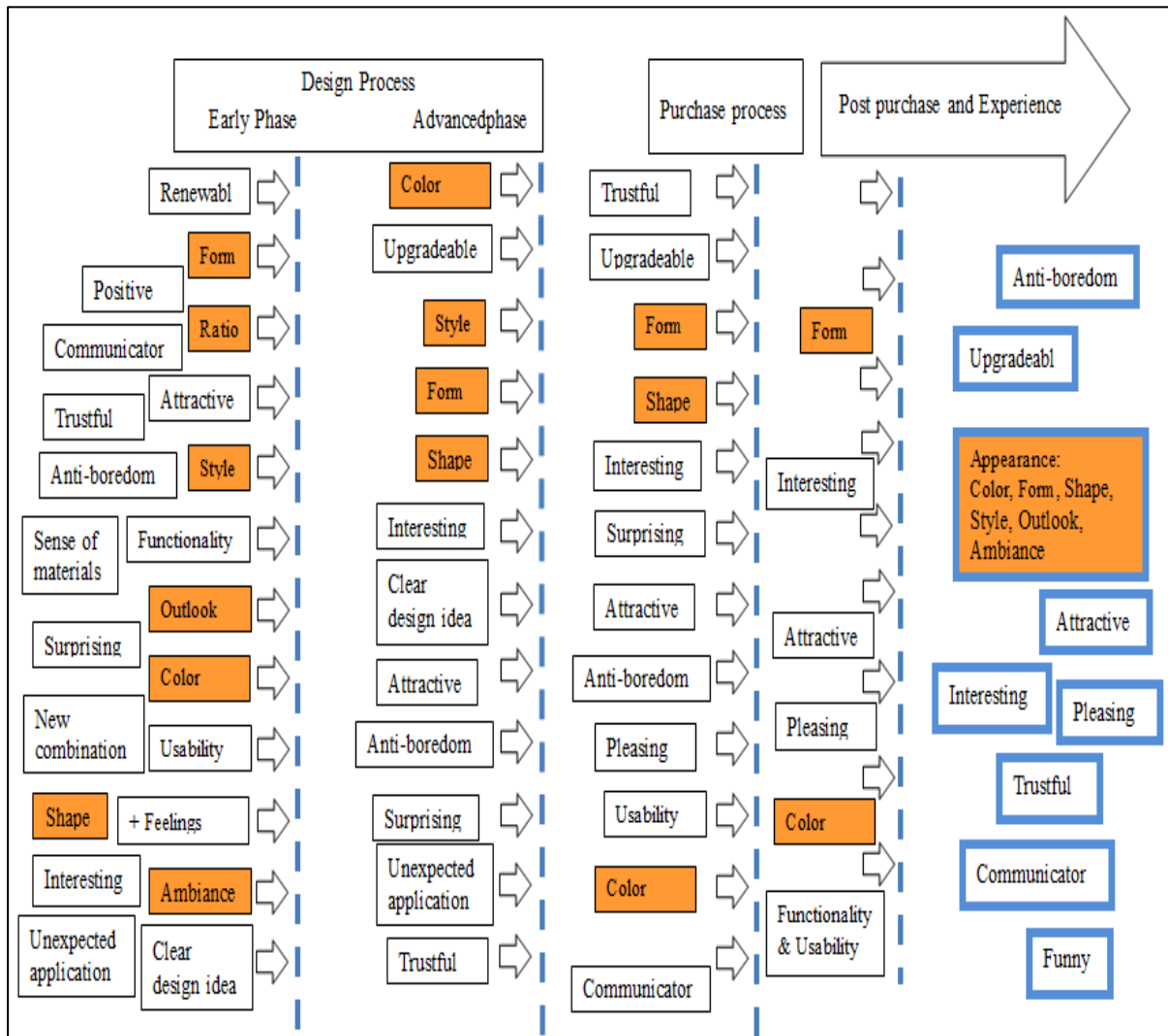
| Design strategy all features | Fig. 5-9: The survived features | Compounded emotions |
| Appearance-related features | of the three-phases strategy of the emotional design concept | Survived emotions |

E- Further Wishes: Respondents liked the idea of their experience and emotions with this product to be followed up upon, this product may improve their experience emotional quality that have been negative before, and they want to be involved in the next development process of this product as well.

These characteristics have been extended through the purchase phase and decision making to be re-constituted and developed into another form in the post purchase and experience phase, for example, color, style, ratio at the design phase have been developed to appearance in

general, upgradeability, and trustworthy at the purchase and experience phase. In the group of features developed, participants expressed them as expectations before and during the design process to be fulfilled in the form of final product features.

The developed emotional design process contained a specific strategy that focused on three main axes to provide three solutions to the research problem which deals effectively with the three levels of perceptions as follows (Fig. 5-10):
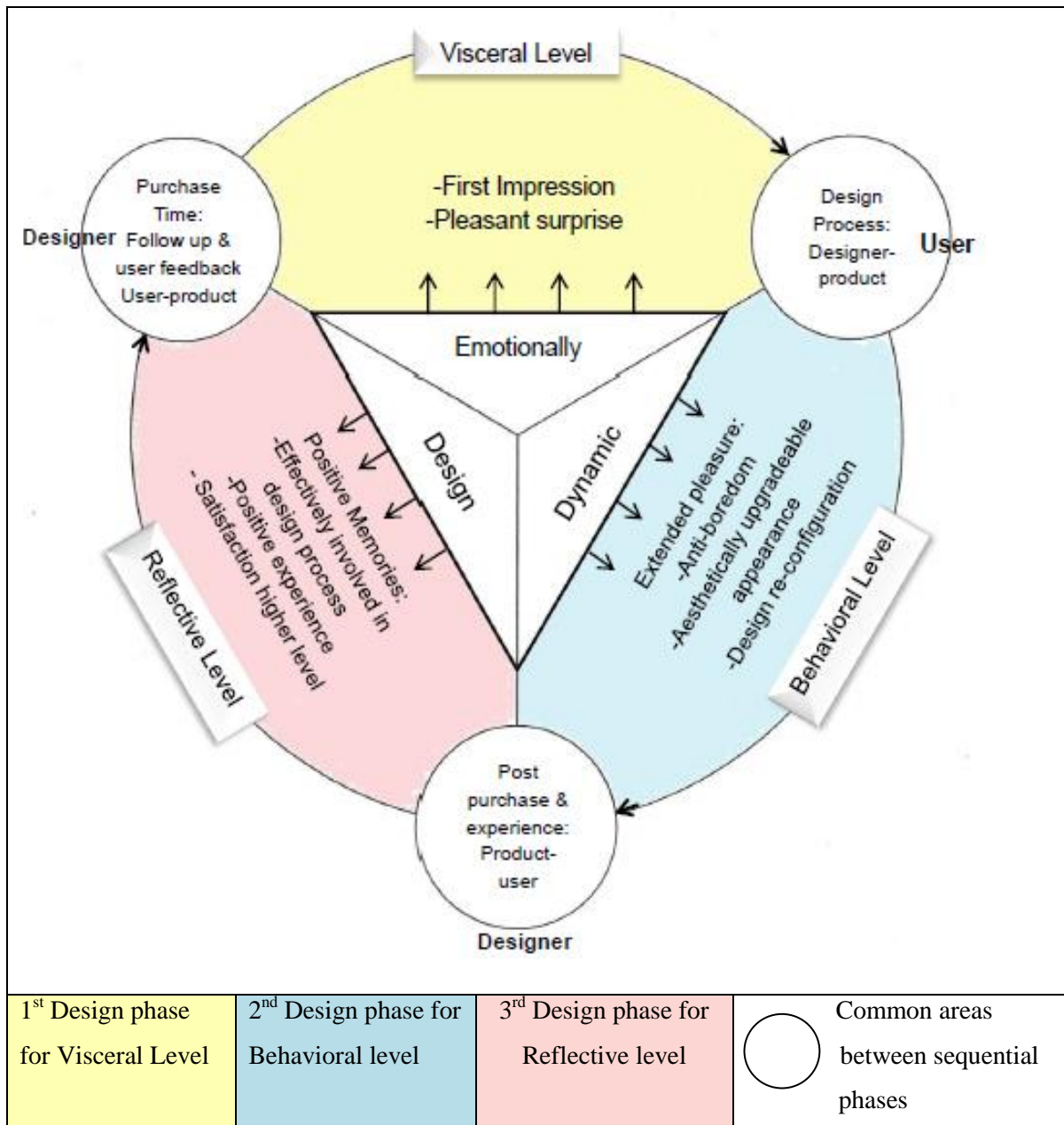
Fig. 5-10: The outline of the emotional design strategy and the three levels of perception

1. **The Reflective-Visceral loop:** The R-V loop refers to the feedback, especially negative, resulting from users' prior experience, and using it as a starting point

for the next generation of product development processes in order to address users' emotions.

2. **Designing for users' dynamic emotions:** Can be accomplished by designing products with visually and /or aesthetically upgradeable appearances and components to match users psychological changes and to help them to overcome negative emotions such as boredom, while supporting positive emotions.

3. **Maximizing and extending users' pleasure:** by designing according to the four pleasures (Physio, Socio, Ideo, Psycho-Pleasure) to cause positive emotions.

This extended pleasure as well as all of these solutions can be carried out by balancing the designer's emotions with the user's emotional needs. Involving users in the entire design process and offering them an opportunity to customize or re-configure their design emotionality before, rather than after purchase, were used to maximize user pleasure.In the next chapter, these three solutions will be discussed in detail to validate them and to clarify to what extent the designer and the user can take advantage of the applied strategy and resulting solutions.

This chapter validates the suggested design strategy and its effectiveness and efficiency in creating an emotional product. And then, it introduces some suggested solutions to and observations of the research problem. In this chapter, the overall results, represented in three main solutions, are evaluated. These three solutions are based on the scientific knowledge-for-a-purpose which represented in an emotional design concept (Coffee table), targeting particular positive emotions to evoke and another negative to accommodate, and to use mass customization application to be used during a co-design process and during the experience with the product rather after purchase only where users still have choices.

This validation based on two elements which are: reasons and explanation of the success of the research outcome (design strategy and the resulted emotional design concept), and the novelty and innovation of this outcome. The two solutions have been achieved by obtaining users feedback about their experience in a reflective-visceral loop, by designing for users dynamic emotions, and by designing to provide users with maximal and extended pleasure.

Validation: Solutions and Overall Evaluation

6.1. Introduction to Suggested Solutions and Validation

Evaluation is a basic component of the development process, from personality to products, and from behavior to feelings, but emotions are unpredictable, and we can never know what will trigger an emotional response without sufficient information (Segal, Smith, & Robinson, 2010). Predicting users' next emotional reaction requires enough accurate information about both the designer's and the user's emotions and how they share the same goal which is product success. All products have three types of features that distinguish them; these features reflect the way the contribution of human factors to product design might be seen by designers and users. These three features are, according to Patrick Jordan (Jordan, 2003, Buchanan, 2001):

- Desirable or Pleasurable: An emotional aspect and something a product can offer as a living object that users can relate to, rather than being just a tool.

- Usable: Those features related to the ease of use which is the most important feature that relates directly to users' emotions (Norman, 2004). Emotions link the user and product during their experience of the product.

- Useful or basic: Features that these products are expected to deliver and what they are essentially meant to do, such as sleeping on beds.

Therefore, this research developed a method aiming at maximizing product acceptance before it is produced, increasing users' pleasure, extending it throughout their experience with the product. This extension can be achieved by using the product's appearance effectively to give users a pleasant surprise resulting in an early emotional connection with the product. Finally, this method aims at extending users' attraction to and interest in the product for as long as possible. A strategy has been applied in this method; this strategy relied on emphasizing the importance of product appearance, not only at the moment of purchase to persuade customers to buy (Darling-Hammond, 2009), but also while users are experiencing products. Also, the applied design strategy depending for its uniqueness on following up on users' emotions during their experience with products. These products were designed to enable them to recover the positive emotions which influenced their purchase decisions by providing them with an aesthetically renewable and upgradeable product appearance.

In other words, this method emphasized the need for ***viscerally durable and attractive*** outcomes represented by a positively perceived product that results from balancing designer emotions with the fulfillment of users' emotional needs (Amic, 2008). This balance means to offer the complete chance for the designer to inject his emotions in the product design during

the design process with offering the users the same opportunity to have their emotional needs to be fulfilled. Also emphasized was the need for ***behaviorally enjoyable and functional*** outcomes represented by positive and pleasurable experiences with the product that stimulate positive emotional responses. Finally, this method aimed at designing a ***trustworthy reflective and engaging*** product for specific target users who were involved in the design process and for whom this product was created to ensure a better emotional quality of the products (Norman, 2004). If we look at user-product relations, we will find that it is necessary to design products with an aesthetically dynamic appearance to conform to this dynamic relationship. This appearance is an effective tool which enables users to overcome the monotony of an extended relationship with their products, especially those with long-term usage products such as furniture. This research considered the negative effect of boredom that may arise during product experience. Accordingly, the design process has been developed to find an effective means of accommodating this effect through the continuous users' evaluation of their experience with the product.

6.1.1. Product Evaluation, and Negative Emotions

Some websites suggest words like "displeasure", "sadness", "unhappiness", or "pain" as being the opposite of pleasure. However, other negative aspects are associated with the absence of pleasure, such as disgust and boredom; these can arise as negative emotions if the experience is not pleasurable (Holt & Lock, 2008). It is important to focus on and be aware of these aspects. Both positive and negative emotional responses that give users an informative cue are context-dependent; these positive or negative emotions may have distinct evaluative meanings depending on the mood in which they take place. This means the emotion can be best understood in the context of the prevailing mood state (Park, 2009). Designers should be quite aware of the products they design, the type of changes and impact they may cause, and users' reactions, whether positive or negative. These changes and reactions exert control over users in the form of positive or negative behavior in regards to the product, as in the frequency of use, for example. In the future these reactions control users' behavior and help determine their next purchase decision.

Accordingly, designers should have their own sensitive evaluative system to judge every individual action or response related to the user-product relation to update their knowledge, since this knowledge is necessary for the development of the next design process. When designers accelerate the updating of their knowledge and user-product relationship evaluation

continuously, they increase the product's emotional efficiency and chances of success. One of the negative emotions during the experience with products is boredom. Boredom is associated with desire rather than actual needs; this desire relies on sensory stimuli, which are the only thing that can evoke the user's interest (Svendsen, 2005). Sensory stimuli motivate particular emotions, such as interest, that control our connection with products and this is how boredom functions. The object involves interest as positive emotion is more identified than the one which involves value, thus, an interesting and valuable object would receive greater emphasis than an attractive one (Chitturi, 2009). This means that the designer should design for both positive emotions such as interest and value together, as well as including some design features to combat boredom and to keep users attracted and connected to their products. Users may also experience another type of boredom called creative boredom; this is characterized by its result rather than its content, and can be experienced when users are forced to do something mundane for an extended period (Dalle Pezze & Salzani, 2009).

There is a link between boredom and users' evaluation of user-product relationship (Roto, 2009). Designers are concerned about their personal success, whereas users are more focused on and interested in having pleasurable products, positive experiences, and maximal satisfaction resulting from having all their emotional needs, as well as their expectations, fulfilled (Jordan, 2003). The designers' concern is limited to the product purchase time, while users have more extended concern from the purchase time until the end of their experience with the product. Throughout the experience time, users' relations with products need to be followed to enable them expressing their negative emotions and responses resulting from their experience with the products. Users' evaluation is the emotional indicator for any emotion evoked, whether negative or positive. Moreover, this evaluation is the emotional scale that can be used in measuring the effect of the emotions that are provoked by the product. Once the designer obtains the user's evaluation, including feedback about their negative emotions, he can begin to develop a way of thinking and designing to inhibit negative emotions and for stimulating positive ones. In short, for the designer to inhibit or accommodate users' negative emotions, it is important to obtain users' evaluations, including the reasons for experiencing the evoked emotion and the role the design played in provoking it. The designer should then provide users with new, emotionally dynamic features or an aesthetically upgradeable appearance to accommodate negative emotions and to extend and support the positive emotions that are stimulated.

6.1.2. Experience with Concepts: An Emotional Evaluation

Focusing on the post purchase phase and user evaluation of experience with products is not an easy task to accomplish especially when the strategy application still in the concept stage. In this phase, the best ideas for production are selected using an investigation about the success of the product concept, as well as by evaluating the attractiveness and value of the concept proposals for the target user group. The focus of this phase of the research is to evaluate user experience only in the early phases of product development and in the existence of rough product concept descriptions (Rantavuo, 2009), not the product itself. Therefore, participants' design concept descriptions, evaluation, and the previous three phases of feedback analysis, can together help identifying the best concept from the user's emotional perspective and validate the efficiency of this strategy in achieving its goals. However, before talking about how to measure the table concept's success or failure in the post purchase and experience phase, it is necessary to know the three components or phases of experience with products, which are: 1) aesthetic experience, 2) experience of meaning, and 3) emotional experience (Desmet, 2007). These three phases of experience were investigated through the table emotional design concept, and throughout the three phases of this strategy. This indicates that it will not be a 100 percent successful product or positive experience, but there are positive indicators that suggest the table will meet an acceptable standard.

6.2. Emotionally Dynamic Design Concept, Psychology, and Behavior

Dynamic is defined in the Oxford dictionary as a force that stimulates change or progress within a system or process, this stimulus can be an external factor rather than something coming from an object itself. However, dynamic products are often related to technological complications, whereas "dynamic" in this research refers to a much simpler product which is visually dynamic and can be adapted to users' emotional changes. However, the first revolutionary aspect of dynamism is associated more with architecture and building to create a visual attraction immediately caught by the human eye. The focus on user-product relations is not a new approach, and there are many studies and much research concentrated specifically on this point, whereas, dynamic design in this research focuses basically on excitement by surprise with continual renewal of novelty (Desmet, 2007). Emotionally dynamic design concepts are based on changeability of user emotions after purchasing products and during their experience with them.

Users' psychological moods may differ completely throughout their everyday life or situations (Dillon, 2010). However, the new psychological moods, especially negative ones when a negative emotion has been recently evoked, are definitely different from the positive emotions that control purchase process. Boredom, as a negative emotion, is one of the most known emotional factors of any purchase (LePera, 2011). Experiencing this negative emotion may result from long-term usage which also emphasizes the need to design emotionally dynamic features into products to accommodate it, any other potential changes in lifestyle, and to establish a durable and positive user-product connection. However, physical motion in particular is one of the dynamic attributes and a typical method of maximizing a product's emotional value by creating an aesthetic shape by synthesizing various design elements according to principles of design form (Nam & Park, 2007).

Furthermore, design elements include components such as form, material and color, and these components usually have visual and static properties, where what is appealing at one moment may not be at another (Norman, 2004). Accordingly, dynamic design elements with dynamic emotional effects have been explored in this research to support users positive emotions continuously, as well as coping with their dynamic psychology, whether conscious or unconscious (Ancona, 1975). Enabling users to cope with these emotional changes can be accomplished by offering them an emotional interaction with their non-digital product by changing its appearance. A psychological approach is one through which human actions and behaviors can be understood and predicted only by analyzing the previous experiences (Svendsen, 2005). When users have the impression that a product is modern, they assume that the new product will infuse their life with a personal substance, but everything new soon loses its novelty. One solution to this predicament is offering users continuous personal and emotional meaning for the moment when the new turns into habit, and negative emotions arisen. This will encourage positive emotional connection with the product because the experience has been turned into desirable and interesting one. In other words, it is important to design for products that retain the sense of novelty for users for a longer time by giving them renewable and upgradeable features to modify the product's visual appearance.

6.2.1. Dynamic Design against Boredom

 Although there are no completely reliable studies about how large a percentage of the population experience boredom, therefore, in this research practical part, a survey aimed at specifying relative percentage for the phenomenon has been done. Nearly 30% of the

participants experienced boredom during their products lifetime usage, and generally, almost one hundred percent of the population suffers from boredom in their life for different reasons (Svendsen, 2005). At the same time, boredom is less with attractive aesthetics; thereby designing for overcoming boredom by designing for aesthetically dynamic design was the base of the table new emotional design concept.

Involving aesthetically upgradeable components in this design was required to attract users throughout the entire perceptual processing. Firstly, by attracting users to the aesthetics of the design created for their visceral level at purchase time. Secondly, by affecting users behavioral and reflective levels positively, by involving them in the design process, and designing for an aesthetically and emotionally dynamic appearance to help them being attracted to and interested in this design during the experience time. At the same time, the coffee table design concept is an attempt to ensure the user an extended and advanced level of pleasure which controlled their purchase decision, to keep them emotionally and visually connected as long as possible.

6.2.2. Table Rotating / Folding Elements and Dynamic Emotions

Emotional experiences are those positive moods, feeling more confident, more optimistic, more energetic, and more sociable (Segal & Robinson, 2010). The concept of emotional dynamic design means the replacement of a part/element to change the product appearance. This upgrade is to draw users' attention and interest as long as possible, and thereby delay their rapid purchase forced by the negative emotions provoked during the experience with the product. Therefore, offering users products with rotating components represents an emotional and personal meaning by changing the visual view of the product by themselves and according to their own desire, in addition to being involved in designing and developing the idea from its initial phase to the end features.

Users, who enjoyed purchasing products because of their appearance positive impact, this enjoyment controlled by positive emotions such as attraction, interest, trust, excitement, etc. Later, those users may have different emotional status, meant to be here the negative one, because of negative stimulus, event, or situation, or simply, a desire to changing their interior design style. In this new situation, users will only fold the upper surface through its open/close option, and/or rotate other element of the table such as the legs or legs connectors to enjoy another visual appearance (Fig.6-1). The new aesthetically configured appearance

relied on users' desire within their pre chosen alternatives, to accommodate their new psychological and/or cope with their stylistic change.
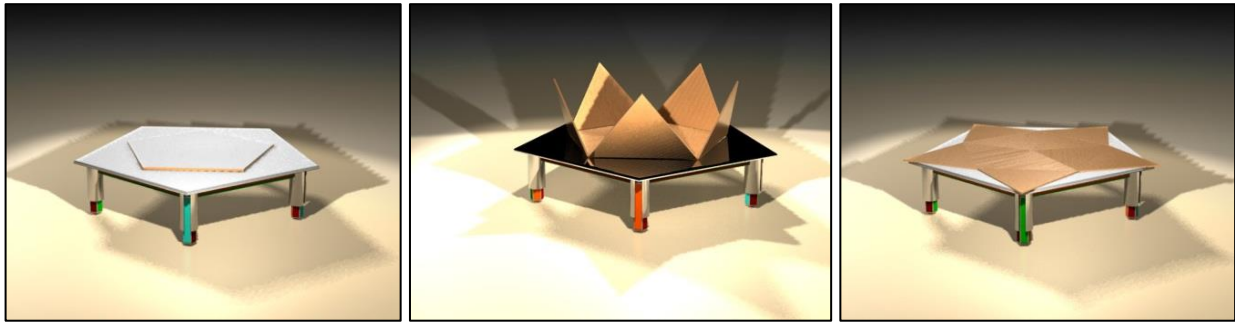
Fig. 6-1: Different appearance by rotating legs, legs connectors, and opening upper surface

6.2.3. Table Emotionally Dynamic Design: Surprise and Satisfaction

Satisfaction is when individual experiences enjoying a recent fulfillment of a need or desire. Users feel satisfied when a well function of a product have been basically well performed for them, or a product combines functionality with beauty or with economy (Demirbilek, 2003). Likewise, users may feel satisfied in once a product plays a facilitating role offered to them from this product (Desmet, 2012). Generally, this is relatively functional perspective that clarifies a field of users' needs than can constitute their satisfaction. However, according to Ekman, Izard, Plutchik, and Tomkins categorization about positive and negative emotions (Desmet, 2012), surprise is another emotional response associated with temporary satisfaction or dissatisfaction and rely on containing pleasant or unpleasant content. At the same time, to draw users attention, or to enable users from experiencing something unexpected or unusual, designers should create surprising products (Ludden, Schifferstein, & Hekkert, 2012), because surprise is pleasant when the unexpected stimuli event/thing is desirable or pleasurable. Furthermore, users can be surprised by what products do, such as how these products respond during interaction, or what users can do with them (Desmet, 2012). On the other hand, surprise may result from liking or disliking relation, as surprising products may be the composite effect of a decreased liking due to unfamiliar characteristics and increased liking due to positive emotions following surprise (Ludden, Schifferstein, & Hekkert, 2012).

Accordingly, surprise and satisfaction have a special role to play in the user- product relation and users entire experience. They represent the start and endpoint of every user's experience with the product, as pleasant surprise constitutes partially and positively the first impression, whereas satisfaction is the end and overall result of a positive experience and leads to

repurchase intentions and ensures users loyalty (Güngör, 2007). Surprise and satisfaction are two complementary emotions, and any designer wants to ensure his success as well as his design's, he should work on surprising users pleasantly then offering them positive experience to earn their satisfaction. Designing for pleasant surprise and users' satisfaction, a coffee table design concept has been chosen as an application for the development of the design process to result an emotional product. Firstly, with this design, users avoid unpleasant surprises, if not this design surprised them pleasantly, because of their involvement in this product design process and co-design it from the very beginning until the end. Then, this design creation based on investigating users' emotional needs and expectations which have been fulfilled and met. These sequential procedures represented the crossing point through which, users expectations have been turned into reality then translated into higher level of satisfaction rather unassuming one that the non-emotional-based design can provide. This aesthetically dynamic design also targeted a wider range of users' types of pleasure according to the emotional features involved as an emotional content during the design process.

6.3. Research Results and Validation

This part of the research aims at validating the efficiency of the strategy in creating an emotional design concept that can help users extending their pleasure and attraction with the product designed with them, as well as inhibiting negative emotion from being evoked because of this product throughout their experience with it. It also aims at determining if this design concept is capable of ensuring them a higher level of overall emotional satisfaction.

"They mark the beginning of an era in product design in which the way we emotionally relate to products becomes of increasing interest and importance. Not only because pleasing products sell better, but also because of the widespread belief that we should put an end to technology driven product design that is not going to contribute to a human and sustainable world" (Overbeeke, 1999).

This statement explains the necessity of this research goal which represented in designing for pleasing products that are not complicated technology-based products, and then the necessity of validating its achieved results. This validation based on two elements which are:

1) Reasons and explanation of the successful outcome (design strategy, and the resulted emotional design concept),

2) The novelty and innovation of this research outcome (Maxwell, 1992).

Therefore, the participants have been asked (Appendix C) to explore their expectations about

the experience with the upgradeable coffee table design concept compared with their experience with any counterpart coffee table they have used. In this validation study, a total of 203 respondents (Male, 119, Female 84**)** from different ages (between 19-34 years old), and from different countries (Germany, Egypt, and U.S.A.) were surveyed for this design acceptance, their first impression, and the expected experience with this design concept. A video of the main design idea was attached to the questionnaire (Wesley, 1982) for more clarification as well as to represent a stimuli for this study. The participants have been asked to evaluate the design concept through answering qualitative and quantitative questions focused on comparing a previously experienced coffee table with the emotional design concept.

The *stimulus* was cited by the researcher that represented in a new design with new feature and characteristics which have been co-designed with some participants at an earlier stage of this research. The results of the study provide a representative and exploratory analysis of the design concept, and demonstrate satisfactory reliable and valid scales of the design concept, the design strategy used in creating it, and the design concept expected ability of satisfying the users emotionally. The results of this validation phase have been constructed on the response of the 203 respondents (119 male, 84 female) about their expected experience and the way they perceived a result of a co-design process to represent a concept testing process (Moore, 1982). Some of the respondents have been involved in the design process of the tested design concept, while most of them experienced it for the first time. Data collected from the questionnaire were transcribed into a word processing program to be grouped and analyzed, and this data included a lot of indicators about the success of this design concept in fulfilling users' emotional needs, its ability in extending the attraction of the user to the product, as well as the ability to delay the next purchase process. The resulted data also explores the reasons "-formed in three layered responses-" behind this success as follows (Qualitative answers):

Type of re- sponse	Characteristics	Key sentences (qualitative and quantita- tive) answers
An initial impact (Desmet, 2007) or first Impres- sion (visceral impact).	Upgradeable appearance	-Psychologically: not boring. -Dynamic shapes and forms. -Motion and boredom. -New vision. -Simple and balanced design. -Very good idea.

			-beautiful look. -Variability and dynamism. -Changes the concept of coffee tables.
	Co-designed		-Most of the participants (77%) think that they will keep this design concept for longer time than the previously experienced one. -Whereas 55% of the respondents think that this co-design process outcome meets your emotional needs and expectations.
	Fulfillment of emotional needs and expectations	Fun	- The coffee table with an upgradeable appearance makes its usage funnier than the previous one.
		Attraction	-Motion and mechanism used in it draws attention.
		Interest	- The coffee table with an upgradeable appearance makes it more attractive.
		Pleasure	- Participants approved with 79.3% that the coffee table with an upgradeable appearance makes it more pleasing than the previous one.
		Trust	- The coffee table -which has been co-designed with some users to be aesthetically upgradeable- makes it more trustable than the previous one.
		Positive Surprise	- The design concept- which has been co-designed with some users to be aesthetically upgradeable - makes it more positively surprising than the previous one.
Second impact at first contact with product at purchase process	Appearance, usability, and functionality issues		-Seems to be usable, and easy to manage. - Ease of changing shapes and appearance. -Attractive appearance, materials, shapes. -Meets my functionality needs. -Usable and my fit to different occasions.
Long-term impact	-Expected positive experience.		-Design was simple and not complicated, the mechanism motion attract attention. - Practical.

| | - Simplicity, upgradeabil- | - Upgradeability is a dynamic utility against long-term usage. |
| | ity, and usage | -85% positive. |

Table 6-1: The qualitative responses and evaluation about the design concept

Participants explored their feelings in a quantitative answers and evaluation about the design concept compared to a previously experienced coffee table. Participants were free to compare between the two models according to particular criteria that related to the emotional features starting at first impression, and then the expected positive and negative emotions that may arise during the experience with the design concept. And finally, they have been asked to evaluate the overall expected experience according to the video presented to them, this video in this phase represents a mean of product presentation exactly like the show windows in the stores. Respondents' quantitative answers can be illustrated in table (6-2) that clarifies how the participants rated the design concept with a higher overall positive emotional impact represented in the individual features and emotions presented to them, as well as totally in the overall expected experience.

In the next few sections these results will be explained to show the significance of the design concept in targeting users' positive emotions and offering them a higher level of an emotional satisfaction.

	Previously Experienced Design	Upgradeable Coffee Table Design
First impression	**2.9**	**5.9**
Happiness	**3.2**	**6.1**
Interest	**3.2**	**6.4**
Surprise	**2.3**	**6.5**
Trust	**4.7**	**5.3**
Boredom	**5.7**	**3.2**
Attraction	**3**	**6.1**
Pleasure	**2.8**	**5.8**
Expectancy	**3.2**	**5.7**
Overall expected Experience	**3.2**	**6.1**

Table 6-2: Illustrates the participants quantitative answers and evaluation of the design concept

6.3.1. The Research Outcome Success: Reasons and Explanation

Final designs characteristics such as the design concept contains emotional layers (positive

first impression, pleasantly surprising, pleasurable, etc.), as well as other functional layers (practical, attractive, innovative surprising, colors and materials variations, stimulating, harmonious, with simple and upgradeable appearance, and curved lines and shapes, and form simplicity), all emphasize the success of the applied design strategy (Desmet, 2007). Also, there are other reasons related to the successful outcome of this research (design strategy, and an emotional design concept), these reasons related to other layered characteristics of the design concept such as the four pleasures it can support (Jordan, 2003). This design concept also showed an ability of changing users' purchase behavior by offering them some fun with it, interacting with it, and finally its dynamic appearance. The user's attention is focused on the immediate satisfaction of responding to the urge to purchase rather than on detecting a pre-existing problem, or determining a design item to fulfill a pre-determined need (Karbasivar, 2011).

Hedonic or affective components are motivations and sometimes purchase factors, while some consumers simply felt a calling to purchase the product (Madhavaram, 2004), and this behavior comes suddenly and may stimulate an emotional conflict. Rook (Rook, 1985) named five essential elements in the urge to purchase: 1) unexpected and self-generated desire, 2) a state of psychological disequilibrium, 3) the onset of psychological conflict and struggle, 4) a decrease in cognitive evaluation, and 5) a deficiency in the awareness of the consequences of impulse purchasing. These five factors illustrate that purchasing new products is a behavior which is probably generated automatically from one's self, once a feeling of boredom with the present product is experienced, in this situation boredom represents psychological disequilibrium (Boyanton, 2013).

Psychological conflict and cognitive evaluation reduction of the product may result from long term usage (O'Shaughnessy, 1987) where the product does not recover the positive user-product relation, leading to monotony, which in turn leads to the desire to purchase a new product. Accordingly, controlling purchase behavior through continuous evaluation to identify the reasons that caused this psychological behavior may help in directing this behavior to repurchase instead of purchase of a different product. This control can be carried out through an appropriate design method or strategy that results in more fun, interesting, attractive, and pleasurable products with more emotional durability in the time they are experienced.

For instance, Volkswagen created the fun theory to change behavior from boring or routine to fun. They described the idea: "Something simple and fun is the easiest way to change people's behavior for the better, for one's self, for the environment, or for something entirely different-

the only thing that matters is that it is a change "for the better" (Volkswagen, 2009). Changing behavior by making products fun is a new concept that is intended to help people to enjoy different tasks. Volkswagen fun theory site gave an award to a new idea, in which the "Piano Staircase" was created to get people using the stairs instead of using escalators or elevators by making the stairs more fun. They turned the stairs into a big piano, and found that 66% more people chose the stairs over the escalator than usual. They also confirmed that fun can definitely change behavior for the better. Therefore, making behavior with products fun can be considered as a behavior changing tool that makes for a more positive experience. Designing fun products aims at changing users' rapid purchase behavior and/or users' disposal of products that are still functioning.

Changing product appearance through installing/uninstalling some of its components and alternatives, folding other components with open and close options, and rotating other components enables users to have fun in their usage of the product instead of experiencing boredom. Users' dynamic emotions require emotionally dynamic design and fun experiences like re-configuring their product's appearance aesthetically during its usage lifetime.

6.3.2. Research Outcome: Novelty and Innovation

Novelty is a product characteristic that places unique emphasis on concept, form, and methods of feedback (Chang, 2007). In the responses of participants, qualitative and quantitative answers related to eliciting pleasure through creativity and uniqueness of the form of design concept were mentioned and confirmed by 79.3% of participants. Moreover, they were attracted (82.8%) to the design concept by novelty value, even before it has been produced, as enjoyment is characterized by a sense of novelty ((Csikszentmihalyi, 1992). "We experience surprise in response to products that we appraise as novel, both in terms of suddenness and unexpectedness. To experience pleasant surprise, the product must be appraised as unexpected and as suddenly matching a concern" (Desmet, 2007). Based on this statement, the users have already confirmed that this design concept has surprised them pleasantly by 79.3%, even when compared to a previous coffee table (fig. 6-2). The next graph shows the other perceived emotions towards the coffee table design concept, whether at purchase time, or as an expected perception throughout the experience with it. As can be seen in the graph, the 203 participants perceived the same positive emotions such as first impression, happiness, pleasure, or other negative one such as boredom.

There are remarkable differences in the experienced emotions with the previous product and the expected emotions with this concept. An explanation could be that users are more familiar with concept because they have the feel that this design - for some far – have met their expectations and emotional needs have been fulfilled. They have been pleasantly surprised because of the new feature added to this design concept, and they are looking forward using it. This could explain the value of their involvement and the efficiency of the applied design strategy, as they may feel a sense of responsibility for a concept because it was designed with them.
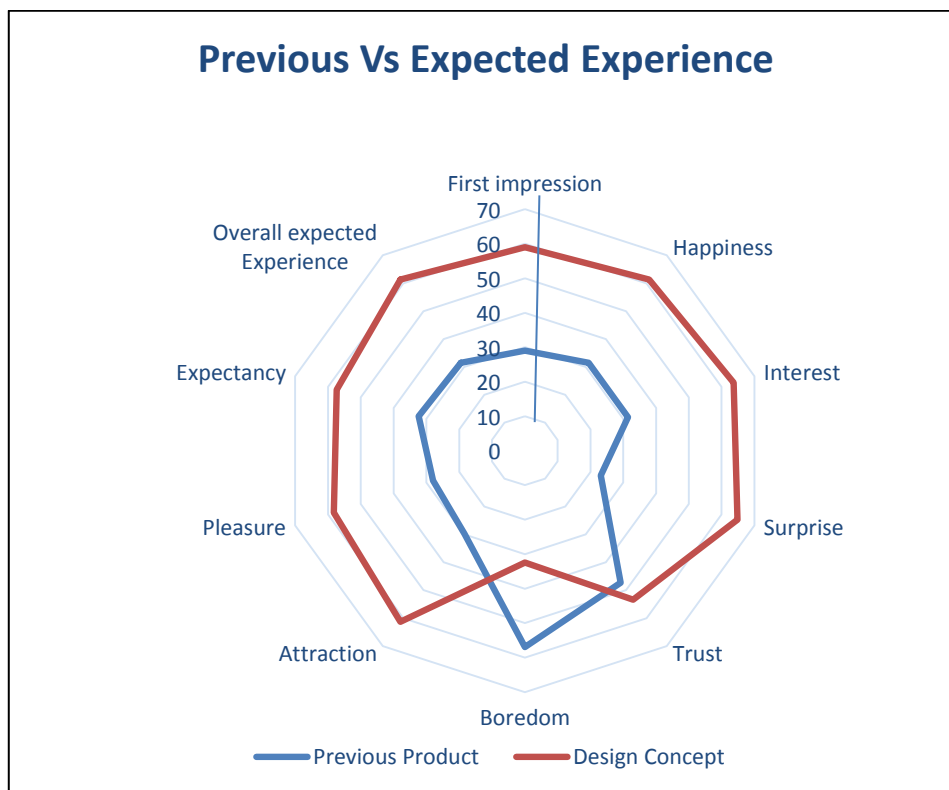
Fig. 6-2: The novelty of the outcome of this emotional design strategy compared to the outcome of the previous design strategies

The results of the stimuli which contained the video of the concept accompanied by explanation text, as well as the qualitative and quantitative questions, showed more differences in the perceived emotions between the two purchase and experience times compared to a previously experienced coffee table. This could be due to the fact that mentioning the functions or specifications of a concept that has been co-designed with some users and its upgradeable appearance as new feature, all together created a clearer and more concrete view of the product even if it has not been produced.

6.4. Solutions: The Reflective-Behavioral-Visceral Loop

António R. Damásio (Markiè, 2009) discussed an important part of decision making processes; this part contained the comparison between emotions and feelings caused by similar past situations or experiences. This comparison enables us to simulate potential future outcomes based on our past experience, and it leads to the best possible solutions (Suddendorf, 2011). The classical behavior of the user (Fig. 6-3) with purchased and experienced products is linear (Saad, 1984). This means, the users' next purchase decision is primarily based on their previous experience and associated with the reflective level of their perception that can inhibit or enhance their visceral level, according to the product's appearance (Norman, 2004).
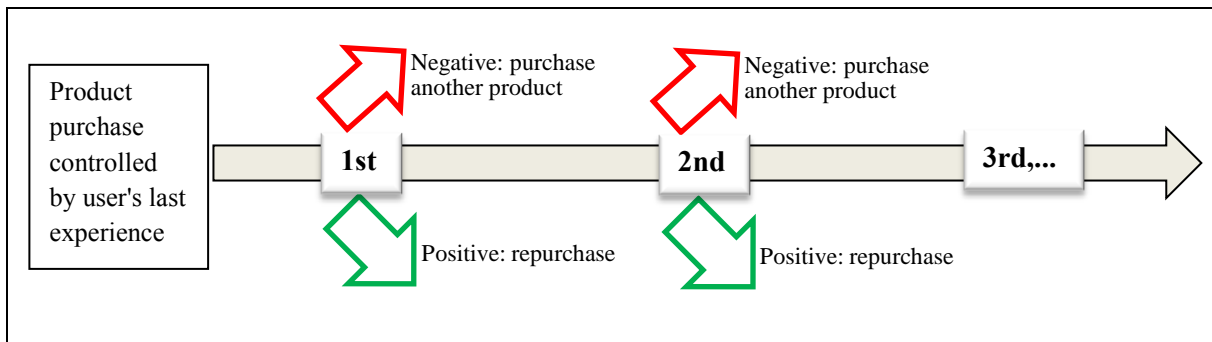
Fig. 6-3: Users' linear sequenced purchases: Purchase behavior and decision making based on previous experience

Users' purchase decisions rely only on users' previous experience, and when this experience is positive it will lead to repurchasing the product, and if the experience was negative the product will be ignored or rejected. Within the design and development processes, designers mostly depend on their knowledge, personal experience in the field of creation, and their emotions (Amic, 2008). Unfortunately, these processes probably ignore users' emotional needs and/or the negative emotions that have been provoked during their previous experience with other products. It is possible, however, to bridge the gap between the emotional attitudes, emotions, needs of designers, and the user's emotional needs. To do so, designers can involve their emotions in the design features while simultaneously enabling users to explore the emotional needs they want to be fulfilled during the design process. To this end, this research has suggested an appropriate method to motivate this linear purchase behavior positively in order to stimulate positive emotional responses for users. This method is the R-B-V Loop: the Reflective-Behavioral-Visceral Loop (Fig. 6-4) which embodies a design structure model based on designer-user emotional communication or designer-user exchange of emotion.

This exchange is based on a dialogue between the designer and the user throughout the entire life cycle of the product, to integrate both designer and user emotions in the form of final product that contains emotional satisfying features. The R-B-V loop is also based on continuous users' feedback describing their experience, and continuous designer evaluation of this feedback. The reflective-visceral model divides the user's overall experience with products into three main phases to deal with every phase according to its content and nature, and the design is created with consideration to these three phases.
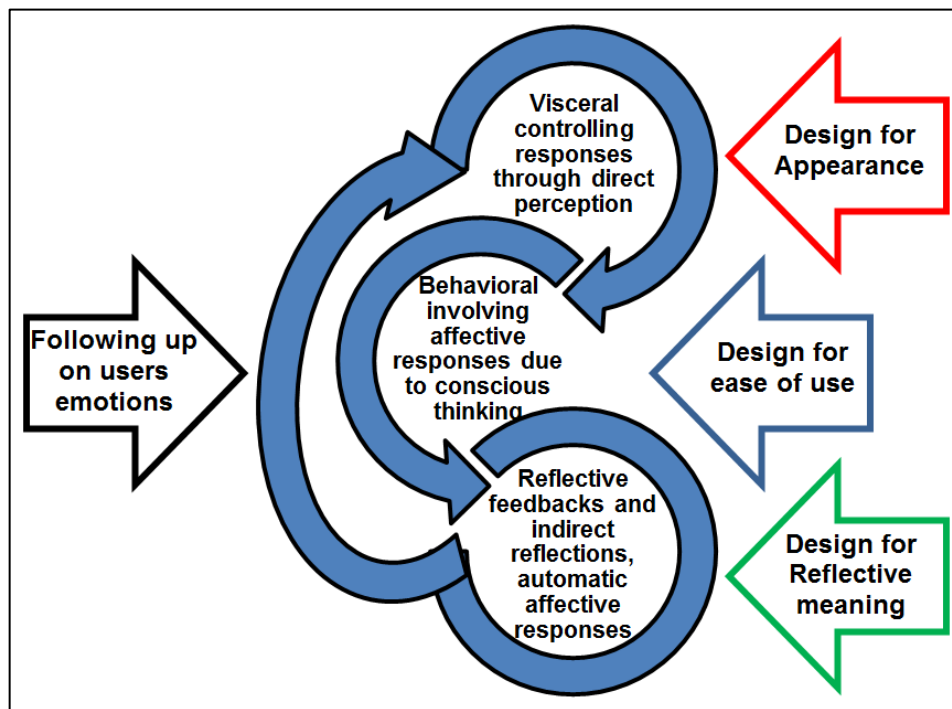
Fig. 6-4: The Reflective-Behavioral-Visceral Loop

The three-level strategy has been built on these three phases which are **1**) Design process, **2**) Purchase time, and **3**) Post-purchase and experience time. The last phase, the post-purchase phase, will be supported by a continuous following up on users' experience and continuous evaluation by the designer to link it with the design process phase in a continuous loop. It is important to use the feedback from monitoring user experience as one of the development process fundamentals.

According to this research, designers and users exchange their emotional content throughout these phases, injecting them in the design from the early design phase until the design of the product's final characteristics, and then throughout the experience time. This model has two advantages; firstly, it emphasizes the designer's control over the product and the uniqueness of the creation during the design process. Secondly, it helps users to explore and express their

present emotional needs accurately, continuously, and to include them as a basic component in the product's emotional, physical, functional, and usable structure.

6.4.1. R-B-V Loop: Three Levels of Perception Function Together

Many efforts have been carried out to categorize emotions. One of these categorizations is based on dividing them temporally as well as cognitively into three categories which are affect, emotion, and sentiment (Aumer-Ryan, 2005, Ortony, 1990, Desmet, 2002, Norman, 2004). In light of these categories and the way the three levels of perception function together, the importance of appearance in controlling the majority of our decisions is confirmed, especially on the behavioral level. In this level, the designer-product relation comes to an end, and focus shifts to the user and her/his product. This is the longest phase of the user-product relation. Even though this relation is still associated, in one way or another, with many parties, including the designer, the design itself, the producer, and the user, at this point the user is by far the most important of these, and emotions are the main factor determining the nature of the relation (Norman, 2004). Designers can do this by using the three levels of perception, especially when designer has enough knowledge about how they function together in a hierarchical order. Accordingly, the more the designer avoids surprising users unpleasantly with a negatively perceived "visceral design" and the more products address users' positive emotions and experience with "behavioral and reflective design", the more those users are likely to be satisfied with the product as well as will positively experience it. Furthermore, users will then tend to repurchase, which is how the designer can prove his design success, accordingly, this will reflect his own success as well.

6.5. Solutions: Emotional Dynamic Design and Four Pleasures

Designing pleasurable products (Jordan, 2003) is one of the recent scientific studies of pleasure and design (Norman, 2004). Designing for the four pleasures basically centered on four main objectives (Desmet, 2007):

- Designing for an initial impact at first sight represented in the first impression.
- A second impact at first physical contact with product at purchase process represented in the positive psychological feeling when users see their involvement result in the form of final product.
- A third pleasure at communicating with others who possess the same emotional product, and;

- A long-term impact represented in a positive emotional experience and a higher level of emotional satisfaction.

According to Patrick Jordan (Jordan, 2003), the four pleasures are not concrete theory of pleasure; rather they are meant to be used as a means of understanding the amount of pleasure that can be structured when looking at user's interaction with interactive systems (Holt, 2008). Although furniture is a non-interactive product, however, the coffee table design concept in this research has been developed to represent new manually interactive furniture that can address users' positive emotions. With this design visual and aesthetic upgradeable appearance as in-put features during its lifetime, to accommodate (out-put) users emotional changes, will classify this design concept as a system of an interactive product in the field of furniture and without technological complexities. This system is a practical representation that aiming at the four pleasures included in this design concept, by exploring users' emotional needs as initial goals to set the ultimate goal of the entire design system (Saffer, 2007). Furthermore, understanding users, motivations, likes and dislikes, relationships with products, emotions, moods, and lifestyle were all involved in a design process. The efficiency of this process outcome has been validated, to translate these criteria into emotional design concept, regarding the researcher viewpoint (Chow & Jonas, 2009). Therefore, the causes of the different pleasures should be examined and considered to emphasize the pleasurable effectiveness of the developed design process, its strategy, and its resulted emotional design. Also, in order to ensure a pleasurable experience, the different motives of this pleasure should be supported to maximize their effect and eliminate what may inhibit them as well (Holt, 2008). These four pleasures have been addressed in the coffee table emotional design concept as follows:

6.5.1. Physio-Pleasure

Physio-pleasure is when the bodily pleasures derived from the sensory organs, and they include pleasures connected with touch, taste and smell as well as feelings of sensual pleasure (Jordan, 2003). A product will appear attractive if its form conveys the promise of fulfilling the tactile needs of the onlooker (Lewaliski, 1988) which represents a physio-pleasure. Therefore, the emotionally and aesthetically dynamic table was designed to offer the user this type of bodily pleasure resulted from its materials combination that involves many choices as well as its aesthetically upgradeable appearance through changing these variations and configuring more combinations during the experience with it as well (Fig. 6-5).

This appearance has not only upgradeable form and color, but also upgradeable texture as well, in order to enable users to accomplish special touching experience with its different physical features. This option of changing its visual appearance aesthetically will enable users to regain the physio-pleasure they experienced during purchasing the product, accordingly, this emotional recovery is to make the positive connection accomplished at the first visual contact between the user and the product renewable, and to extend users satisfaction as long as possible (Kirakowski, 1988).
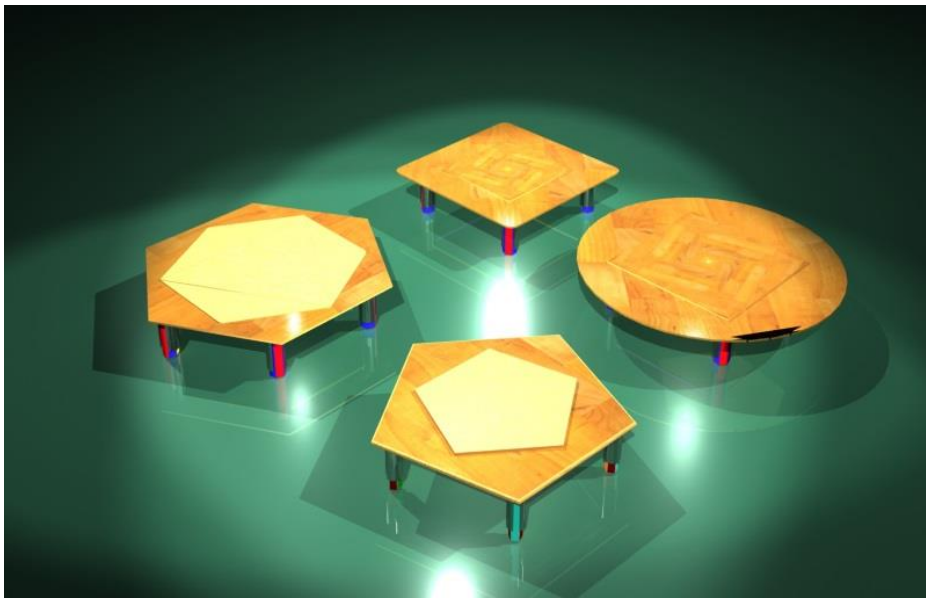
Fig. 6-5: Table dynamic design: a physio-pleasure stimulated from feelings of sensual pleasure represented in material different combinations

6.5.2. Socio-Pleasure

Socio-pleasure combines different sociable aspects of interaction, cooperation, sharing, and community based activities (Forty, 1986), and that is what the alternatives of the emotionally dynamic table can offer for users. The user can exchange her/his table alternatives (Fig. 6-6), or share some of them with other users within the same product owners. Socio-pleasure is about people expressions when given the opportunity to anonymously record and share positive feelings and thoughts with others (Abdul Mutalib, 2012, Kemper, 2004). However, when users exchange or share these alternatives -that still functioning- with the same product owners or users, this facilitates the social interaction and communication between them through using or possessing the same product (Jordan, 2003). Each component has its alternatives, and every type of them can be purchased with the table according to user's taste and desire. The feeling of changing these alternatives or choosing other options during the

experience time can be shared within the same users group such as the same family to represent a focal point for a little social gathering (Jordan, 2003).
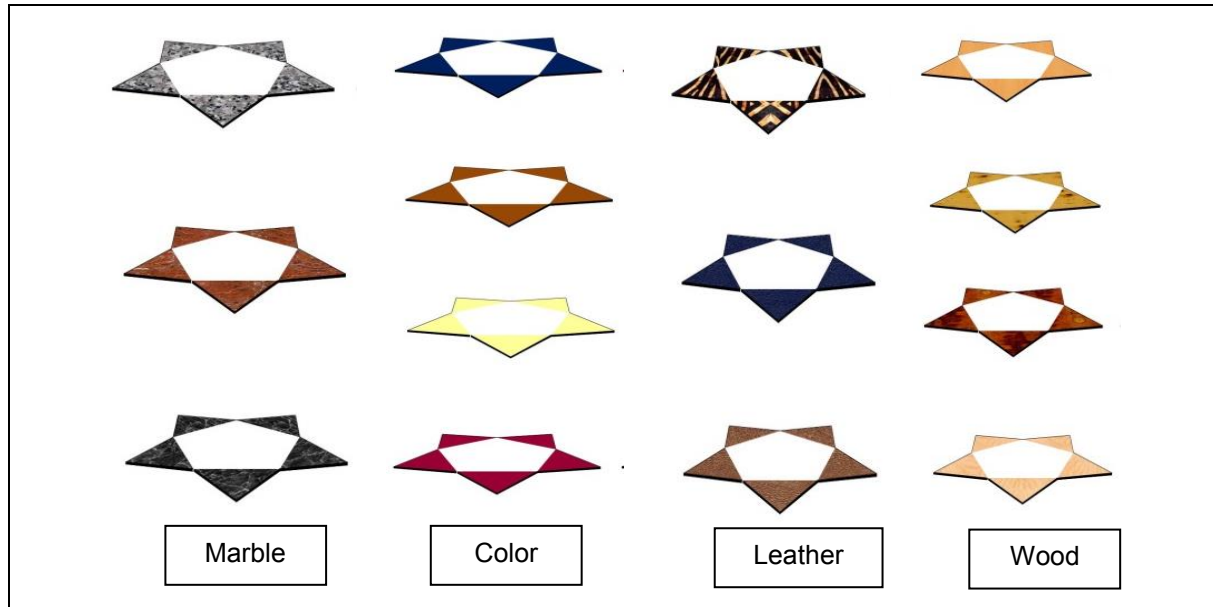
Fig. 6-6: The exchangeable or sharable alternatives of the pentagonal upper surface of the emotional coffee table

6.5.3. Ideo-Pleasure

Ideo-Pleasure is the aesthetic sensibilities often closely linked to our ideological or cultural identity (Tiger, 1992). It is about pleasure that relates to personal aspirations and moral values, and closely related to be/do goals (Jordan, 2003). However, in the Ideo-pleasure, the reflection lies on the experience, where one appreciates the aesthetics, the quality, or perhaps the extent to which a product has an environmental value (Norman, 2004).

This coffee table emotional design has an aesthetical value represented in its form idea and users considered its appearance attractive, simple, and interesting as well. Moreover, this design concept includes a cultural meaning represented in re-configuring its appearance while using it which copes and integrates with the modern aspect of purchase then assemble or install at home that many companies –such as IKEA- apply to their products. At the same time, the alternatives of this design components are made from recyclable materials, in addition, these alternatives have an appropriately long lifecycle because of sharing them which together might be seen as reflecting the value of environmental responsibility (Jordan, 2003). Accordingly, the negative effect of disposing them will be reduced and purchasing new product will be delayed according to the extended life cycle of these alternatives. Therefore,

these advantages together will offer users an ideo-pleasure and will affect them positively at the reflective level as well.

6.5.4. Psycho-Pleasure

Psycho-pleasures are those pleasures derived from cognition, discovery, knowledge, emotional aspects, and other things that satisfy the intellect related to product usage (Tiger, 1992). Psycho-pleasure can be evoked with this coffee table design concept from quick learning about the main working idea at the first time of usage, especially when the design has been introduced to users during their involvement in its design process. The emotional table design concept has a simple, learnable, memorable, and pretty consistent idea according to users' viewpoint, this idea led to a certain sense of satisfaction because of its simplicity and efficiency in addressing users' negative provoked emotions as well as supporting and extending the positive one. For example, table emotional design represented interest and fun for users therefore they will purchase it. They considered changing its appearance manually, by rotating some component and opening/closing other according to their desire, is something funny, interesting, and may help them overcoming boredom (Fig. 6-7).
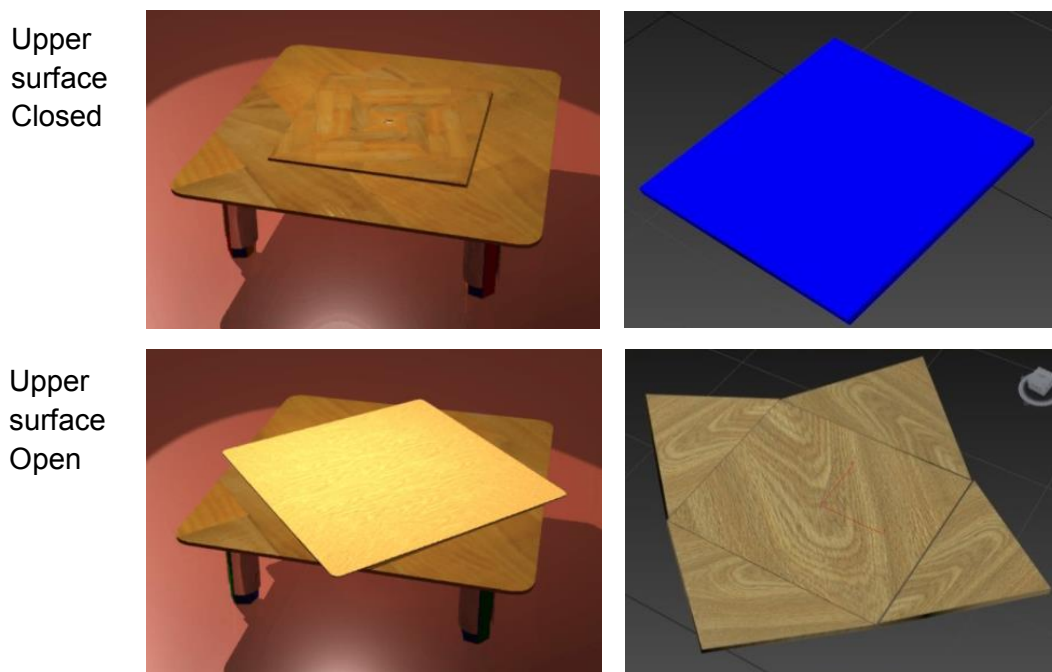
Fig. 6-7: Open/close option of the upper surface to change its appearance visually and aesthetically represented fun and interest for the user

Users approved that, re-configuring the coffee table appearance visually and aesthetically represent self-confidence enhancing. They believed that, when trying to create their table new

appearance to differ from the one they purchased, this may give them self-confidence of being able to design by themselves.

6.6. Mass Customization: Designer-User Emotional Exchange

Mass customization implies rapid response to customer requests, high efficiency, and limited cost overheads of customization (Brabazon, 2006). However, before designing and applying a mass customization strategy, one of the most relevant success critical factors should be examined; this factor is about customer demand for the customized product (Blecker, 2006). Accordingly, mass customization focused on fulfilling individual user's needs in her/his product. This fulfillment takes place after these products and their alternatives have been designed, produced, and purchased, but how about after purchase? How about user-product relation when the purchased product no more meets user's emotional needs? And what users can do when their experience/relation with it has been negatively affected because this product evoked negative emotions? Also, mass customization focused mainly on mass production of individually customized goods and services, and it provided strategic advantage and economic value (Wikipedia, the free encyclopedia), but how about an emotional value to be offered for users by using it? These are some questions raised and needed to be answered. Therefore, this research developed an emotional design process based on a specific strategy, this strategy included certain tools. One of these utilities has been involved with different function; mass customization has been used for customizing the design components emotionally (Fig. 6-8). It has been also used for meeting users' emotional needs and translating their expectations practically into concrete realities, and this can be the first time within design process.

Moreover, mass customization can be used normally for the second time as configuration tool after purchasing the product for deeper response and more fulfillments of users' emotional needs to represent an emotional value, especially when using it during the design process could not satisfy them emotionally. The advantage of this emotional mass customization is not only the timing, but also the content based on this timing, as this customization used for obtaining users satisfaction within components and alternatives of a design that not yet produced. This provides users with higher level of satisfaction resulted from closer reading of their thoughts within more design solutions rather product components and alternatives, and this represents real customization. Knowing that, using this application in the early design phases where users explore their ideas and emotional needs, as well as within the design

process rather after production and/or purchase will increase its efficiency of fulfilling users' emotional needs.
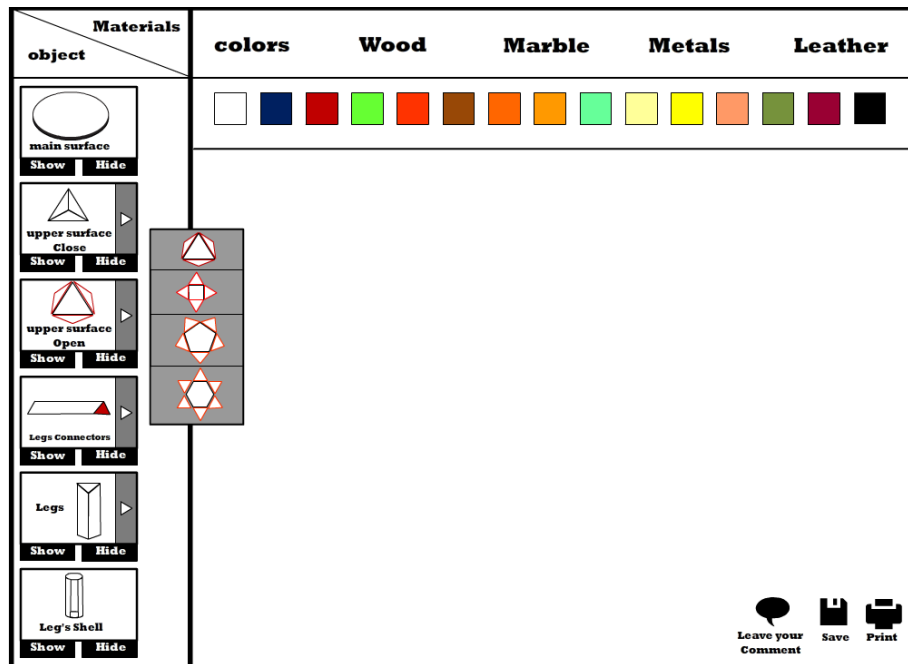
Fig. 6-8: The interface of mass customization application used for customizing users emotional needs before product purchase

In other words, the entry point of the customer in terms of timing and the content involved in this customization constitute this customization efficiency and effectiveness in meeting users emotional needs deeper and more specifically as well.

This chapter reviews, discusses, and concludes the thesis, as well as summarizes the key findings with description and analysis, of the entire research.

This chapter then proceeds to outline further research that could be undertaken in this field.

Chapter 7

Discussion, Summary, and Future Work

7.1.Discussion

Several initial questions were posed in Chapter 1 (see section 1.5 and 1.6), such as: How to structure a design application's outline that evokes users' positive emotions by co-design not by accident and durable, not for short-impact? How can the positive response from the pleasant surprise at the user's first contact with the product be extended into pleasure throughout their post purchase experience? How can the user's negative emotions be accommodated after purchase to maintain a stable emotional, positive long-term experience, without boredom, and with a higher level of an emotional satisfaction? There were also other questions raised during the research such as: How can unpleasant surprises be avoided? How will users respond emotionally to products as objects and artifacts when they are involved in the design process and evaluation? Which methods, tools, insights, and strategies can be developed and used to deeper understanding the users' emotions and the design effect on these emotions? And finally, how negative emotions such as boredom impact the user-product relation?

These questions were all based on the previous state of the art and scientific background related to emotion and design field. These questions also defined the content of this dissertation and they have been explored and answered to varying degrees throughout this research course. According to these questions and hypotheses, I began to suggest some possible avenues towards solutions to the research problem. These hypotheses (see section 1.7) were used in determining the ultimate goals, and the method/s that could be used to achieve them. This thesis generally focused on three main approaches (see figure 1-6) which were presented in details in chapters 2, 3, and 4. These approaches together comprised the basic theoretical content and background used in structuring the practical or application part in chapter 5, which accordingly have been validated to lead to the final results of the research in the chapter 6. There have been a mixed research methodology -quantitative and qualitative- that was used to conduct an investigation about the pre-cited target group, explore their emotional needs, and then fulfill and meet these needs in an emotional design concept. The results of the research can fit into the existing body of the emotion and design knowledge as well as the design process itself. These results can help, for example, the beginner designers to accurately specify the needs of the same target users' emotional needs in general, and in particular, the emotional needs required at design process, at and after purchase time, and finally throughout the experience with the product. The resulted design strategy, in addition to representing an evaluation to the design process, it is an outline of an application that results

in an emotional design in general, emotional furniture design in particular. Moreover, the current theories of emotions assume that some emotional experiences seem to happen faster than would be predicted if they are necessary to evaluate the situation and physiological response, while this research with its resulted design process outline can enable designer from predicting- to some extent- the expected emotional responses related to a designed object with an emotional content.

Also, customers stay with the company for years when the company designs for their emotions, this is because the company's designers are able to understand customers' needs better than the customers themselves. Thereby the company offers them a higher level of the experience quality with the product. It means selling more products, and customer re-purchase and loyalty. Also, the theories of emotions show the similar emotional responses resulted from the different emotions as disadvantage, while they can be considered as advantage on two ways:

- Positive emotions: The similar emotional responses resulted from positive emotions can be evoked together with one stimulus by targeting them clearly and accurately. For example, aiming at positive emotion such as surprise may lead to stimulate other positive emotions such as trust, self-confidence, pleasure, and interest.
- Negative emotions: On the other hand, many negative emotional responses can be inhibited by targeting one negative emotion, such as avoiding boredom may strengthen users' connectivity, communication, happiness, and pleasure with their products.

Plutchik argues that the closer to one another these emotions lie on the wheel, the more they have in common, fear and surprise shares the quality of reacting to the unknown, whereas this research proved that users may feel bored with an object, but they are not necessarily feel disgusted from it. Also, trust and acceptance lie on the same side of the wheel, and as a result of the validation study, users accepted the design concept more than the previously experienced one, however, they trusted their previous coffee table more that the new one. Trust is more related to many factors such as actual experience not the expected one, for example. Most of researchers and scholars focused their interest on measuring the emotions evoked by these products and how to develop the way of evoking these measurement tools. This research represents an attempt to offer the chance for users/participants to co-design, explore, and then re-design their own products without the need to obtain their emotional

expressions by using one of the emotional measurement tools. Users have an important target in their priorities list which is exploring their emotional needs with full description whatever the method is, and wherever the place was. They need their emotional needs to be translated into a real emotional design with actual emotional features, whereas, using a specific measurement tool in exploring their emotional response, there is no chance, then, for mentioning the reasons behind these reactions, accordingly, the emotional reaction is related to one particular situation and without specified reasons as well. In this dissertation, an e-mailed survey was used to explore the users' emotional needs freely, with flexibility, and with reasons.

This research aimed also at emphasizing the importance of following up on users emotion during their experience with the product, and how this experience phase affect strongly on their purchase decision process. Previous studies on "Design and Emotion,, focused more on the time of purchase especially the use of mass customization applications and how to persuade users to purchase, ignoring their emotions when they change during their experience with the product. The use of mass customization during the design process rather after purchase represents more effectiveness in meeting users' emotional needs as well as functionality and usability. On the other hand, and in the light of Donald Norman's three aspects of design based on the three hierarchical levels of perception (see section 2.7.1.); I created an outline of the structure of a design process by applying an emotional design strategy. This strategy relied on these three levels - to function together- and aspects to evoke specific durable positive emotions, and inhibit or accommodate other negative ones. However, most of previous researches focused mainly on users emotional responses at purchase time which basically related to the visceral level only.

Therefore the design outline of this strategy based on dividing the design process into two main phases, early and advanced phase (see section 5.3., 5.4., and 5.5.), in addition to a third phase that focused on the post-purchase and experience time. The structure of the strategy consists of three levels (see figure 5-10):

- User involvement in the design process is aimed at dealing with the three levels of perception: the visceral level, to target users' positive first impression surprising them pleasantly, the behavioral level to ensure the users pleasurable usage, and reflective level to target positive memories by recalling the positive memories of being involved in the design of a successful product.

- ▪ The outcome of the design process in this research was an emotionally dynamic, aesthetically upgradeable design concept aimed at the behavioral and reflective levels of perception. This design concept targeted users' behavioral level by enabling them to upgrade the design appearance aesthetically and thereby emotionally during the experience time to ensure them a positive experience for as long as possible.

Likewise, Jonathan Chapman in his book (Chapman, 2005) considered designing for emotionally durable design, but he focused on the techno-centeric products, and his main concern was in the environmental impact of products disposal while these products still functioning. Chapman focused on expanding products' physical life span to reduce waste, while in this research the focus is on the durability of attraction to products appearance- for a sustained positive emotional experience. The engagement with products represented not only in a positive first impression like other studies focused on, but also throughout the experience with the product. The insights gained in this study can support emotional design as they contribute to providing a structure for emotional design process, and these insights may guide junior designers who aim at designing for emotions to achieve it successfully.

7.2. Thesis Summary

I have spent nearly 5 years of my Ph.D. studies working on answering the main research questions (see section 1.6.). In this thesis, I have tried to answer some questions that are relevant to the initial research questions to help divide the main research problem into categories. The first and second part of the dissertation dealt with a theoretical approach in the field of design and emotion. Detecting, investigating, and searching for literature review about the theories associated with emotion, investigating perception's role in the acceptance or rejection of products, and examining how emotion and perception motivate and control users' decisions were necessary to answer the main research questions.

During that time I have scrutinized existing research on theories of emotions, perception as cognitive sub-approach, and the design process. At the same time, I have focused on the user-product-designer relation from the very beginning of sketching the design, where this relation should start, until the product has been purchased and experienced. This traditional relation can be described as:

" *going into a store and trying to find a needed or desired item. Being approached by a sales associate, getting help if wanted, deciding to make a purchase, proceeding to the checkout line, and taking the product and leaving.*

This relation explored other questions of importance to the design profession that should be taken into account along with the main research question. These questions are: How can unpleasant surprises be avoided at the first user-product contact time? How will users respond emotionally to products as objects and artifacts when they are involved in the design process and evaluation? Which methods, tools, insights, and strategies can be developed and used to deeper understanding the users' emotions and the design effect on these emotions? And finally, how negative emotions such as boredom impact the user-product relation?

In order to include a wider field of theoretical background that enabling the research to answer these questions, this thesis contained seven chapters organized according to the user-product relation, and focused on the importance of ensuring the product is viscerally attractive, behaviorally functional, and reflectively desirable to the user. Therefore, this research structure is based on four main parts (see figure 1-6):

- **The First Part:** The introductory chapter (Chapter 1), where the main concept in the thesis, emotional design, was introduced. In this chapter it was important to preview the most relevant works previously done in the field of design and emotion, especially previously designed tools for measuring user's emotional responses.

- **The Second Part:** Consisted of three consecutive chapters (2, 3, and 4) related to three fields required for constructing the theoretical background and literature required for the suggested strategy and focused on design and emotion. **Chapter 2** was important to gain an in-depth understanding of emotions, their importance, and their components and constituent elements. The most relevant theories of emotion to this research focus were briefly investigated. In **chapter 2**, it was also necessary to consider the psychological dimension of the theoretical structure by studying a sub-cognitive approach which is perception. **Chapter3** was also part of the substrate of the theoretical structure; the main focus in this chapter was on the psychological impact of design element aesthetics from an emotional perspective to illustrate the link between the psychological effect of emotion on product perception, and the role of design element aesthetics in delivering this effect positively. Furthermore, it was necessary in **chapter 3** to clarify users' phases of satisfaction and how to satisfy those users by designing in cooperation with them to gain their trust and loyalty. It was necessary to clarify how to transition from "designing for the user'' to "designing with the user'', as well as evokes users' positive emotions by co-design not by accident and durable not for short-impact. As co-design process, in this thesis, was an attempt to allow the user

to share responsibility with the designer for the success of the product, as well as participating in the design process. And the choice of co-design relied on any approach that offers the users a chance to share the design process of their products with the designer. Then**, chapter 4** focused on explaining how to extend the effect of these aspects positively throughout users' total experience with their products, this required focusing on product emotional lifetime extension. Moreover, **chapter 4** served as a segue to the next chapter, which contains the design application, by referring to the concept of upgradeable products and the most common reasoning that motives users to purchase new products, thereby examining the link between user purchase behavior and the emotional lifetime of the product.

- **The Third Part: Chapter 5** is intended to apply the theory in a specific design which is a Coffee table design concept. Applying an outline of a design method based on a three-level strategy was the start point. The intended outcome of this design process was a product design concept that would be aesthetically upgradeable during its usage lifetime, and aimed at appealing to the behavioral level perception. This three-level strategy worked together on the entire perceptual processing complex as well as accommodating users' emotions during their experience with the product. Every level resulted in a specific output which have been used with other inputs as the starting point for the next level.

- **The Fourth Part: Chapter 6** is where the overall evaluation, validation, solutions have been discussed, and how efficient and effective the three-level strategy was in achieving its goals and helping to find solutions to the research problem. **Chapter 6** resulted in the R-B-V Loop as the first solution, based on using feedback from users about their last experience as a basis for the new design or development process. Furthermore, **chapter 6** highlighted the importance of designing products to be emotionally dynamic as the second solution. This dynamism, in this case, involves rotating or folding elements with open/close options as an outcome of the design strategy. Finally, **chapter 6** emphasizes the role of this strategy and its outcome in satisfying the user with different types of pleasure, such as psychological, social, physiological, and ideological pleasure.

This is the main structure of this thesis, which has been carried out in a specific sequence with particular research methodologies differed between the Descriptive, the experimental, and the

normative approach (see section 1.12.). This division was required because of the approach's interweaving of two topics related to the research's main focus, Design and Emotion.

7.3. Thesis Findings and Conclusions

Design and emotion is a relatively new, and increasingly flourishing, research field, and this research pointed to three interwoven concepts related to emotional interaction between users and products: positive emotional responses, user-product emotional communication, and positive emotional experience. This research aimed at providing knowledge about the emotional design that addresses users' positive emotions, give them a pleasant surprise, and accommodates negative emotions that arise during their experience with products, to provide them extended positive experience for as long as possible. Therefore, the hypotheses were constructed to develop the design process based on addressing and dealing with the three levels of perception together; on the user's involvement and evaluation, the follow-up after purchase, and design re-configuration during the user's experience with products, to result in an emotional design and ensure the user's positive first impression and positive experience, and will delay new product purchases. Moreover, this research presumed also that, products with upgradeable appearance during their lifetimes will help users to recover their positive feelings, inhibit/accommodate negative emotions related to the product, such as boredom, extend the duration of the user's attraction to their product, and support mutual designer-user trust. This aesthetic and emotional upgrade could consequently lead to better product experience with a higher level of satisfaction.

These concerns determined the sequence of the thesis structure and required particular knowledge and experimental study that included an investigation about specific target users with and to whom this emotional product will be designed. Variety of research methodologies have been used to conduct enough data, qualitative and quantitative. A word processing program have been used to group and analyze the resulted data to obtain a graphical representation of this data. All these procedures were to reach the goals of this research, and then resulted in the final conclusions and findings. Accordingly, the conclusions and findings of this research were organized as follows:

1- It is important to start any research on an emotion based design approach with careful control of the overlapping disciplines relevant to this topic, with consideration to the coherent relation between evoking users' positive emotions, perception, and design elements.

2- It is important to deeply understand the psychological impact of design elements and how users perceive them, individually/final design with complete relations between these elements. This effect should receive more focus when aiming at users' positive emotions and experience to users.

3- When assessing product appearance, boredom, as negative emotion, and its role in purchasing new products, urgently requires design solutions to prevent users from losing interest in the product and keep the user-product relation strong. Users need to possess products with individualistic touches and memorable, enjoyable events that engage each customer profoundly with their products not only at purchase time, but also throughout their experience with the products.

4- Perception should be thoroughly studied as a way of inciting positive perception of the product in users' psychology.

5- Designers have to reduce the gap between them and their users with insight that balances the emotional vision of both designers and users.

6- The co-design process can be used not only for fulfilling users' emotional needs, engaging them emotionally with their products, but also for involving users in the responsibility for the success of their products along with the designer.

7- Mass customization technique should be used in the design process and during product usage, in addition to being used in customizing the product according to these needs after purchase.

8- A product's emotional lifetime can be extended by attaching an emotional value to it, and then extending this value throughout the experience with it in parallel to extending the product's physical lifetime.

9- Re-branding is one of the most used strategies for extending product lifetime, but to be used efficiently and effectively, it should focus on the product's emotional features and originate from user's emotionally dynamic needs. Enabling users to recover their positive feelings which motivated them to purchase was seen as the main advantage of re-branding in this research.

10- Purchasing new products is influenced by negative emotions just as much as the positive ones in term of their critical role in shaping users' experience positively or negatively; thus, inhibiting negative emotions, and evoking positive emotions should be at the top of every designer's list of priorities and design process goals. Products that include components that are upgradeable by installing/uninstalling these

components, and are therefore aesthetically upgradeable, may delay the purchase process.

11- Product aesthetic upgradeability can be used as an effective means of user-product communication, as well as social communication between users and their families or with others.

12- Boredom, trust, disgust, fun, attraction, and interest are some of the most important emotions in controlling the purchase decision and the user-product relationship, and the designer is able to improve the whole user-product relation including the emotional quality by involving appropriate content.

13- The three-level strategy succeeded in testing the design appearance separately from the other characteristics and features of that design in order to measure and evaluate their emotional effect and how users perceive them after co-designing.

14- Being involved in co-designing, evaluating, and re-designing their products during the usage lifetime was a pleasant feeling for users.

15- A new design concept can be presented and evaluated through computer-aided tools such as 3D models or on-screen model such as videos, especially when the evaluation is limited to a design concept's appearance.

16- The three-level design strategy has proved that some emotions that design appearance can evoke are essential and most user experience them throughout the entire design process, at purchase time, and during the experience with the products, these emotions such as interest, attraction, fun, trust, and pleasure (see figure 5-9).

17- This research has explored some other features of an emotional design that vary according to the target users. Generally, an emotional design should be/have the following characteristics:

▪ An unexpected application, like an aesthetically upgradeable appearance during usage lifetime.

▪ Upgradeability option which can be used as means of users-product communication.

▪ Involvement of personal meaning, such as being re-designable during the experience with it. This feature was considered as an emotional value.

▪ An interactive product without technological complexities.

▪ Resulting in designer-user partnership because this design is based on users actual and continuously updated emotions.

- Includes an emotional content in its physical properties. These features, such as round edged shapes or forms selected because of being more desirable, safer, reliable, and visually comfortable, are all related to product appearance and the tactile and visual properties of different materials. Also, warm colors represent an emotional meaning of warmth, a positive feeling of connectivity, and a positive perceptual perspective.

To conclude, I hope this thesis proves to be one small step in achieving the goals outlined.

7.4. Future Work and Recommendations

Some questions were not fully answered by this work and will require further investigations to be resolved. More experimental and practical efforts are necessary to full understanding of deeper dimensions about the field of design and emotion, therefore:

1- It is recommended to apply the constructed strategy to address other emotions such as excitement and to extend the feeling of excitement for as long as possible throughout experience with products, as well as inhibit other negative emotions such as disapproval.

2- In this research, the suggested design strategy was applied to a small business or master pieces furniture design, and it is recommended to find a way of how to apply this strategy to a wider range of production such as mass production by implementing this strategy in particular company such as IKEA. Therefore, applying the resulting three-level strategy on IKEA design and development management can be in the form of providing customers an option to participate in the design process as volunteers. The communication of IKEA towards consumers takes place in four types of major media the catalogue and other booklets, websites of the group, another advertising media such as newspaper industry, radio, television, cinema and posting, and the communication in the stores. Through these touch points; however, the company can follow up on customers to obtain continuous feedback about the experience with the products they co-design.

3- It is recommended to apply this strategy to other types of products within the field of furniture such as structural furniture (chairs). These applications aim at creating an emotional interactive furniture without technological complexities. It could also be valuable to apply this strategy or developed design method to provide the user with an opportunity to upgrade her/his design style to represent a broader range of applications. Including other stylistic alternatives for these design components may

    represent another advantage aiming at more satisfaction for users who prefer changing their interior design style frequently.

4- It is recommended to apply this strategy using a final product or prototype to measure this design concept efficiency at extending pleasure in the experience with the products.

5- In general, it is recommended to apply this design strategy to other types of products which have shorter usage lifetime than furniture such as mobile phones.

It was remarkable that the results of this research were not 100% satisfying, as participants in the validation study for example, approved that the coffee table design concept is trustable less than their old one. This impression can be explained due to the previous experience when users have already tried using the old previous coffee table, while the tested concept still neither produced nor used.

Referring to the research design in general, it would be better to clarify in detail that the whole issue is a problem of design rather than marketing and customer relation management. Design is about solving design problems by creating features to be included in the design in order to improve users' quality of their experience with products. Moreover, marketing and customer relation management should start at the design process to change the traditional concept of user-product relation, and the necessity to begin it earlier. However, the earlier determine and evaluate problems raised because of the product, preferable at the design process, the more to avoid users' rejection of these products. Nevertheless, it would be valuable to link the results of this research to the marketing and customer relation management for more support and wider range of application.

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Appendix A

The Early Design Phase Questionnaire

-Emotional Design: means a product can elicit several emotions. Emotional design is a design with features that extend beyond function, form, and usability, to emotional dimensions that enrich and provide the users pleasurable experiences by meeting their needs and demands. Emotional design supposed to strengthen the enjoyment of product usability by creating a strong mental attachment between users and products.

-Concept of upgrading product during its lifetime

Most users may have some emotional changes in the course of their everyday life; others believe that the spectacular new designs for home appliances fail to fit into their lifestyles, which raises the question: How can users be offered the chance to upgrade their product during its usage lifetime to accommodate these psychological changes, or to combat negative emotions such as boredom, and/or to better fit into their lifestyles? This survey provides you with an opportunity to share your thoughts on what is needed to keep you and your emotional needs satisfied, not only at the time of purchase, but also during your experience with products, in order to attain a higher level of satisfaction. This survey can also help the designer to construct a developed designing method for your emotions, by specifying the "emotional design" features.

-**About upgradable Design**

Please remember that the usability, functionality, and ergonomic features of this design in this questionnaire have not been included as this research more focuses on design appearance. This table has been designed to make a positive impression on the user, and to reach a higher level of satisfaction through its upgradeable appearance. You do not have to complete this survey if you do not wish to do so. However, everyone's opinions are important and the more people who participate, the better the results will be. Please understand that this questionnaire is completely confidential. The following questionnaire about a new "Coffee Table Design" will take about 25 minutes to complete, but will provide us with valuable information.

Section 1: Personal Data (optional)

Q.1. In which age group are you?

○ 19 - 22   ○ 23 - 26

○ 27 - 30   ○ 31 - 34
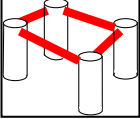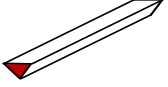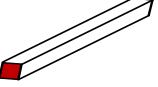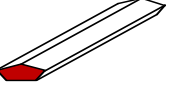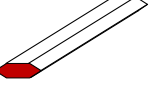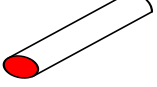
Q.2. Gender
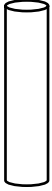
○ Male   ○ Female

Section2: Please choose your <u>desired geometric form of the table (furniture) design,</u> and please, rate your choice/s from (0-10). In this section, you can choose and rate (from 0 to 10) more than one element or alternative

Q.3	which of these shapes would you prefer for the Upper Surface (closed)?	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate
		Triangle		Square		Pentagonal		Hexagonal		Without Upper Surface at all		I don't know	
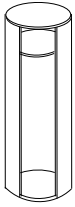
Q.4	Which of these shapes would you prefer for the Upper Surface (Open)?	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate
		Triangle		Square		Pentagonal		Hexagonal		Without Upper Surface at all		I don't know	

Q.5	Which of these shapes would you prefer for the legs connector ?	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate
		Triangle		Square		Pentagonal		Hexagonal		Cylinder		I don't know	

Q.6	Which of these shapes would you prefer for table's legs?	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate	Choice	Rate
		Triangle		Square		Pentagonal		Hexagonal		Cylinder		I don't know	

Section3: Opinion about DESIGN Characteristics. Please indicate your desired <u>Design Appearance characteristics and related personal expectations</u> of the table (furniture) design. In this section, **C** for choice (%), and **R** for rate (from 0 to 10) more than one option
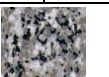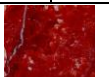
Q.7	Which of these colors do you prefere for your Table Main Surface ?	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
		1 White		2		3		4		5		6		7		8		9		10		11		12		13		14		15		Others
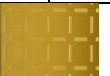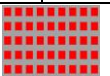
Q.8	Which of these colors do you prefere for your Table legs shell?	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
		1 White		2		3		4		5		6		7		8		9		10		11		12		13		14		15		Others

Q.9. Which of these Materials/Textures samples do you prefer? **C** for Choice (%), and **R** for Rate (from 0 to 10)

-Wood	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
		1		2		3		4		5		6		7		8

-Marble	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
		1		2		3		4		5		6		7		8		9		10		11		12

-Metal	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
		1		2		3		4		5		6		7		8		9		10

-Leather	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
		1		2		3		4		5		6		7		8		9		10		11		12

Q.10. Do you think that design appearance features like other Forms, shapes, colors, materials, or textures will help make this design more emotional**?** If you have a suggestion, Please write it/them below.

-	
-	
-	

Section4: Overall Opinion about Previous Product Experience

Please tell us about your previous product (Coffee Table) experience. Please, answer and/or choose the answer that most closely matches your immediate opinion about each attribute. In this section, *__please choose only one option for each question.__*

Q.11	Did you understand the main idea of this design? -Yes -No
Q.12	Have you had positive/negative experience with any "coffee table"? If the answer is no, please skip to Question 15. -Yes -No Please, tell us about your experience, and why it was positive or negative. Answer:………………………………………………………………………………….
Q.13	If yes, what did you expected to see in the appearance of this design and what did you not expect to see? Answer:………………………………………………………………………………..
Q.14	What was the main reason you bought a new table? - I like its design. - It fits to my interior decoration style. -I was bored with my old one - Good price/value. -Other, Please write one or two reasons………………………………………………..
Q.15	How much of your decision to buy a new table is represented by "Boredom"? - 0 %- 25% - 26%- 50% - 51 %- 75% -76%- 100%
Q.16	How do you evaluate your involvement in the product design process? Answer:………………………………………………………………………………...
Q.17	Do you think you will be more likely to purchase this product after your involvement in the design process than if you had not been involved? -Yes -No Why?..

Section5: OVERALL OPINION ABOUT *THE NEW DESIGN*

Please indicate your opinions about the design elements that you expect to see in the next

version of the coffee table design. Choose the button that most closely matches your immediate opinion about each attribute. In this section, ***please choose only one option for each question,.***

		Strongly agree	Agree	Neutural	Disagree	Strongly disagree
Q.18	Do you agree that this design already has a new combination of shapes /colors /materials /textures?	○	○	○	○	○
Q.19	Do you agree that user should participate in the design process?	○	○	○	○	○
Q.20	Do you agree that involving the user with the designer in the design process will result in an emotional products?	○	○	○	○	○
Q.21	Do you agree that your participation in your product design process may influence your overall opinion about the design positively?	○	○	○	○	○
Q.22	Do you agree that your participation in the product design process may influence your overall opinion about this design negatively?	○	○	○	○	○
Q.23	Do you agree that the user with the designer (co-design) in the design process will result an emotional design?	○	○	○	○	○
Q.24	Do you agree that the user's emotional needs are as highly important a component of product success as usability and functionality?	○	○	○	○	○
Q.25	Do you think, using several types of shapes in the same design improves its emotional quality?	○	○	○	○	○
Q.26	Do you think, using several colors in the same design improves its emotional quality?	○	○	○	○	○
Q.27	Do you think, using several types of material/texture in the same design improves its emotional quality?	○	○	○	○	○
Q.28	Do you think installing /uninstalling different options for design elements during	○	○	○	○	○

	lifetime usage is a good idea?					
Q.29	Do you agree that installing /uninstalling different options for design element will be an easy task to accomplish?	○	○	○	○	○
Q.30	Do you agree that, flexibility to change the appearance of the design/design components will connect you emotionally to your product?	○	○	○	○	○
Q.31	Do you agree that the flexibility to change the design appearance will make this product emotional one?	○	○	○	○	○
Q.32	Do you agree that changing the appearance of the product during its lifetime is a good idea?	○	○	○	○	○
Q.33	Do you agree that, form /shape /colors /material/texture are emotional features and can contain personal and/or emotional meaning?	○	○	○	○	○
Q.34	Do you agree that, being able to re-configure your product appearance visually and aesthetically during its lifetime is an advantage over the last table you experienced?	○	○	○	○	○
Q.35	Do you agree that not being able to re-configure the appearance of your last table may affect you negatively?	○	○	○	○	○
Q.36	Do you agree that design with its customization options can help prevent boredom with products?	○	○	○	○	○
Q.37	Do you agree that changing your product appearance will delay purchasing another new one?	○	○	○	○	○
Q.38	Do you agree that having a visually upgradable product will help you to stay *interested* in it for longer time?	○	○	○	○	○
Q.39	Do you agree that having a visually upgradable product will help to keep you *attracted* to it for longer time?	○	○	○	○	○
Q.40	Do you agree that this idea will increase your trust in the	○	○	○	○	○

	product/designer?					
Q.41	Do you agree that this new feature (upgradeable appearance) may prevent you from getting rid of it after a short time?	○	○	○	○	○
Q.42	Do you think that this design will be emotionally satisfying to you?	○	○	○	○	○
Q.43	Do you think that this design will make a positive first impression?	○	○	○	○	○
Q.44	Do you think that this design will represent a positive experience for you?	○	○	○	○	○
Q.45	Do you believe that you will purchase this design after it has been produced?	○	○	○	○	○
Q.46	Do you agree that boredom had an effect on your relation with your previous coffee table?	○	○	○	○	○
Q.47	Do you agree that "Boredom" can be considered as a reason to purchase a new table?	○	○	○	○	○
Q.48	Do you agree that it would be better to try using this product to judge its appearance and other features?	○	○	○	○	○

Q.49	Please tell us about your previous experience with similar products in the same category (tables). What was the main reason that made you decide to purchase new one? Please use these key words: appearance, functionality, usability, mood, negative emotions, slylistic changes, convenience, feeling of material, and design style. - - -

Q.50 Finally, we may need to contact you to follow up on this survey. Would you mind if we contact you?

          -Yes   **-No**

Please Save and send us the complete survey to let us know your opinions

Thank you for completing this survey

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Appendix B

The Advanced Design Phase Questionnaire

Emotion's explorations:

The design is an emotional explorer when it evokes any kind of emotions when we use or even see. Attached to this questionnaire computer-aided tool (video) and an application used in presenting you the design main idea, concept, and features to choose and see your choice result.

The coffee table design concept is a co-designed through a design process based on involving particular users in its design process and exploring their emotional needs. This design concept has an upgradeable appearance –by installing/uninstalling its design components with some alternatives- during its lifetime usage as a new feature. The purpose of this phase of the questionnaire is to explore any further emotional needs and/or to confirm your choices in the previous phase of designing it. Every participant, kindly, is asked to compare her/his choices in the first phase and in this phase to confirm or edit his choices and answer the following questions for more understanding of your emotional needs.

This questionnaire consists of 5 basic groups- consist of 17 questions. It will take about 20 minutes to complete. For every question, please select the rate that express your evaluation for both designs. Your responses will be confidential and will only be used within the scope of this research. Your participation is completely voluntary, and you are consenting to participate by filling out the survey.

Please, watch attached video and application first, choose your favorable items and their alternatives, to design your final coffee table design concept, and then answer the following questions.

<u>Section1. Importance of Emotional Features of Design.</u>
Below, there are lists of features that are part of the product. Please, check only one answer.

Q.1. How important is each of the following features to you?

	Extremely unimportant	Unimportant	Neutral	Important	Extremely important
-Design Image (modern, chic, classic)	○	○	○	○	○
-Ambiance (nice, relaxing, comfortable)	○	○	○	○	○
-Positivity (stimulates positive emotions, moods, feelings)	○	○	○	○	○
-Trust (stimulates confidence in designer)	○	○	○	○	○
-Boredom (inhibits/accommodates boredom)	○	○	○	○	○
-Surprising (pleasant surprise)	○	○	○	○	○
-Appearance	○	○	○	○	○

-Fit (acceptable form)	○	○	○	○	○
-Shape (simple, smart, complicated)	○	○	○	○	○
-Color (expected, surprising, colorful)	○	○	○	○	○
-Renewability (may accommodate - psychological changes)	○	○	○	○	○
-Sense of material (richness of materials)	○	○	○	○	○
-Functionality and convenience (good function and usability)	○	○	○	○	○

Q.2. Based on the description of the coffee table design concept, at purchase time: **How will this design represent to you, if you decided to purchase and it was within your budget**? Please check one.

-Interest
○   Interesting
○   Not sure
○   Not interesting

- Attraction
○   Attractive
○   Neutral
○   Not attractive

- Happiness
○   Delightful
○   Neutral
○   Not delightful

- Surprising
○   Pleasantly surprising
○   Neutral
○   Unpleasantly surprising

- Pleasure
○   Pleasurable
○   Neutral
○   Not pleasurable

-Expectancy
      Expected
      Neutral
      Unexpected

Q.3.Which of the following attributes do you associate with this coffee table design concept? Please state your <u>**first impression/reactions**</u> after seeing this new product design

shown in the video, or you have chosen

-Appearance
- ○ Interesting
- ○ Neutral
- ○ Boring

-Design idea (based on User's Emotions Design)
- ○ New
- ○ Neutral
- ○ Old fashion

-Being positively emotional (evokes positive emotion, for example makes you feel happy)
- ○ Evokes positive emotions (happiness, pleasure, and fun)
- ○ Neutral
- ○ Evokes negative emotion (sadness, disappointment, and uncertainty).

-Being negatively emotional (evokes negative emotion, for example makes you feel bored)
- ○ Yes, it evokes negative emotions.
- ○ Neutral.
- ○ No, it does not evoke negative emotion.

Section2: Overall Opinion about Design emotional Features, with reasons

Filling in with keywords, Please fill in the following information using these keys

Q.4. Please, state your **First Impression/Reaction** after seeing this Design Concept shown in the video, or you have chosen, and **why?**
- ○ positive
- ○ Neutral
- ○ Negative

Q.5. Please, state how you would rate **The Appearance** of this new Design concept shown in the video, or you have chosen, and **why?**
- ○ Attractive
- ○ Neutral
- ○ Not attractive

Q.6. Please, state how you would rate **The Design** of this new product Design concept shown in the video, or you have chosen, and **why?**
- ○ Stylish (chic, classic, modern)
- ○ Neutral
- ○ Ugly

Q.7. What would you **Change in The Design** shown in the video, or you have chosen, and **why?**
- ○ Appearance in general
- ○ Design idea/concept

○ Shape, form, line

○ Sense of materials

○ All of the above

Q.8. Would you purchase this product when it is available?

○ Yes Why? …………………………………………………………………………..

○ No Why? …………………………………………………………………………...

Q.9. How often do you think you will **Use This Product** in case you would like to purchase it?

○ 8-12 Times/day

○ 5-7 Times/day

○ 3 Times/day

○ 1-2 Times/day

○ Never

Q.10. **How much does boredom represent to you as motive to purchase a new product?**

○ 0%-15%

○ 16%-30%

○ 31%-45%

○ 46%-60%

○ More than 60%

Q.11. What are the **Emotional Explorations Strengths** (Emotional advantages) of this Design?

Answer………………………………………………………………………………

Q.12. What are the **Emotional Explorations Weaknesses** (Emotional disadvantages) of this product?

Answer: ……………………………………………………………………………

Q.13. What would be the **most convenient way that may enable you to be emotionally connected to this product**?

Answer: ……………………………………………………………………………

Section 3: Expected Experience with the Design

Q.14. With respect to the previous versions of the same Tables' design you currently use**, please indicate the extent to which you agree or disagree with the following statements that matches your opinion about the design concept you have watched.**

To be completed during and/or after designs video is being watched

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
-This design is easy to understand and deal with.	○	○	○	○	○
-I think I will be in control of the components of the design when it has been produced.	○	○	○	○	○
-I think I will be able to learn how to use all that is offered in this design.	○	○	○	○	○

-I think Installing and uninstalling of components is easy to do.　　○　○　○　○　○

-I assume This design is engaging.　　○　○　○　○　○

-The contents of the design components match my emotional needs.　　○　○　○　○　○

-This design is easy to understand and deal with.　　○　○　○　○　○

-I think I will be in control of the components of the design when it has been produced.　　○　○　○　○　○

-I think I will be able to learn how to use all that is offered in this design.　　○　○　○　○　○

-I think installing and uninstalling of components is easy to do.　　○　○　○　○　○

-I assume this design is engaging.　　○　○　○　○　○

-This design is easy to understand and deal with.　　○　○　○　○　○

-The contents of the design components match my emotional needs.　　○　○　○　○　○

-I assume getting started with this design component is easy.　　○　○　○　○　○

-This design options are flexible and enough.　　○　○　○　○　○

-I can find the options I want in the offered alternatives.　　○　○　○　○　○

-I assume it is easy to make changes of alternatives exactly as I want.　　○　○　○　○　○

-It looks that, discovering new emotional features may happen with time.　　○　○　○　○　○

-I got my emotional expectations come true with this design idea.　　○　○　○　○　○

-This design is satisfying to possession.　　○　○　○　○　○

-I may get bored from using this product.　　○　○　○　○　○

-I will be positively and emotionally connected to this design.　　○　○　○　○　○

-I will be happy when I have been followed up during my experience with this product.　　○　○　○　○　○

-I want to be positively involved in this product next development.　　○　○　○　○　○

SECTION 4: Overall Opinions about the Product Attributes and Emotional Features of the Virtual Final Product you Co-Designed

Please, choose the button that most closely matches your immediate opinion about each attribute.

Q.15. **Product Attribute, what do you think/feel about the entire final visual product?**

		Very	*Fairly*	*Neither*	*Fairly*	*Very*	
-Design idea	Clear	○	○	○	○	○	Confusing
-Appearance in total	Interesting	○	○	○	○	○	Boring:
-Color	Harmonic	○	○	○	○	○	conflicting
-Form	Sleek	○	○	○	○	○	Bulky
-Outlook	Nice	○	○	○	○	○	Ugly
-Style	Stylish	○	○	○	○	○	Ambiguous
-Feeling	Comfortable	○	○	○	○	○	Un-comfortable
-Proportions	Consistent	○	○	○	○	○	inconsistent
-Design idea	Clear	○	○	○	○	○	Confusing
-Appearance in total	Interesting	○	○	○	○	○	Boring:
-Color	Harmonic	○	○	○	○	○	conflicting
-Form	Sleek	○	○	○	○	○	Bulky
-Ease of use	Easy to use	○	○	○	○	○	Difficult to use
-Function	Obvious	○	○	○	○	○	Ambiguous
-Design connectivity	Strong	○	○	○	○	○	Non-existant
-Product recommendation to yourself/others	Definitely Yes	○	○	○	○	○	Definitely No
-Ease of use	Easy to use	○	○	○	○	○	Difficult to use
-Function	Obvious	○	○	○	○	○	Ambiguous
-Design connectivity	Strong	○	○	○	○	○	Non-existant
-Product recommendation to	Definitely Yes	○	○	○	○	○	Definitely No

yourself/others

		Very	Fairly	Neither	Fairly	Very	
-Ease of use	Easy to use	○	○	○	○	○	Difficult to use
-Function	Obvious	○	○	○	○	○	Ambiguous
-Design connectivity	Strong	○	○	○	○	○	Non-existant
-Product recommendation to yourself/others	Definitely Yes	○	○	○	○	○	Definitely No
-Ease of use	Easy to use	○	○	○	○	○	Difficult to use

SECTION5. **Product Emotional Expectations and Suggestions (Pleasure, how to feel pleased?).** Please indicate your opinion about: What do you expect to feel when you use the product? How?

Q.16. **What do you expect to feel when you use the product? What do you suggest to positively feel?**

		Very	*Fairly*	*Neither*	*Fairly*	*Very*	
-Pleasure: What does design need to make you Happy while using it?	Happy	○	○	○	○	○	Sad
-Confidence: What does design need to make you confident while using it?	Confident	○	○	○	○	○	Unsure
-Security (not Harmful): What does design need to make you Secured while using it?	Secure	○	○	○	○	○	Insecure
-Stress: What does design need to make you Relaxed while using it?	Relaxed	○	○	○	○	○	Stressed
-Pride: What does design need to make you Proud while using it?	Proud	○	○	○	○	○	Embarrassed
-Sociability: What does design need to make you Sociable when having it?	Sociable	○	○	○	○	○	Solitary

-Sophistication: What does design need to make you Sophisticated while using it?	Sophisticated	○	○	○	○	○	Un-sophisticated
Communication: What does design need to make you connected to it while usage?	Communicator	○	○	○	○	○	Non-communicator

Q.17. **Other than the product design itself, which of the following would most influence you positively when deciding to buy a new one?**

○ The new design appearance

○ Features such as its upgradeable elements and alternatives

○ Functionality and usability

○ Negative emotions arise such as boredom, and/or mistrust

○ All of the above

○ Something else (please, list them):

-
-
-
-
-

If you have any other comments, such as: Were these questions enough to explore and describe your wishes and/or expectations related to the next version of this product? Or, anything else you would like to add. Then, please write them in the text box below

Please Save and send us the complete survey to let us know your opinions

Thank you for completing this survey
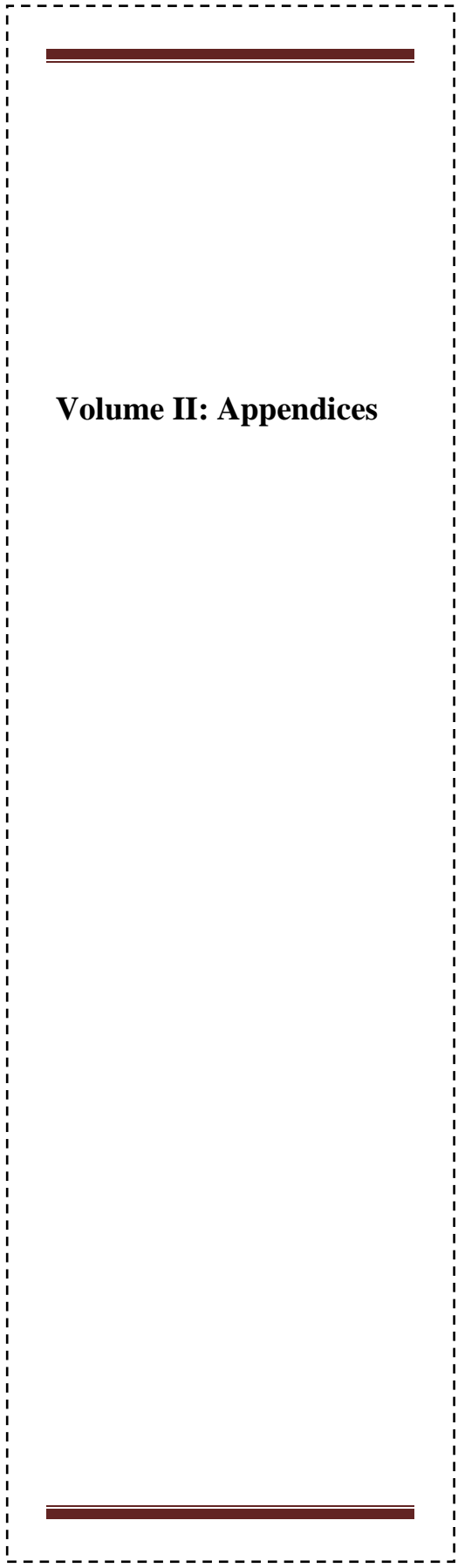
Volume II: Appendices

The Expected Experience Questionnaire

The coffee table design concept

The coffee table design concept is a co-designed through a design process based on involving particular users in its design process and exploring their emotional needs. This design concept has an upgradeable appearance –by installing/uninstalling its design components with some alternatives- during its lifetime usage as a new feature. The purpose of this phase of the questionnaire is to complete the last stage of the whole research-particularly the validation phase- by exploring and comparing the previously experienced coffee table to this emotional one. Attached to this questionnaire a video that has been presented to the participants in an earlier phases of its entire design process. Every participant, kindly, will compare it to any previously experienced coffee table and answer the following questions.

This questionnaire consists of 3 basic groups- consist of 17 questions- which explore required data about your previous and expected overall experience with this type of products. It will take about 15 minutes to complete. For every question, please select the rate that express your evaluation for both designs.

Your responses will be confidential and will only be used within the scope of this research. Your participation is completely voluntary, and you are consenting to participate by filling out the survey.

Section 1: Personal Data (optional)

Q.1   In which age group are you?

○   19 - 22   ○   23 - 26

○   27 - 30   ○   Older than 30

Q.2.   Gender

○   Male   ○   Female

Section 2: Quantitative overall opinion

After watching the video of the coffee table design concept with upgradeable appearance which you co-designed, with your previously experienced one, please choose the appropriate answer that describes your experience.

Q.3   What is your first impression about this coffee table design concept?

○   Positive

○   Negative

○   Neutral

Q.4   Do you expect becoming bored from using this upgradeable coffee table?

○   Yes   Why? …………………………………………………………………………...

○   No   Why? …………………………………………………………………………...

Q.5   If yes, when do you expect becoming bored from using this coffee table after being produced?

○   0-6 Months   ○   7-12 Months   ○   2-3 Years

○   3-4 Years   ○   More than 4 Years   ○   I don't know

Q.6 **Do you think that you will keep the coffee table because of its upgradeable appearance for longer time than the previously non-upgradeable one?**
○ Yes, I will
○ No, I will not
○ I do not know

Q.7 **Do you think that you will keep this coffee table which has been co-designed with some users- for longer time than the previously experienced one?**
○ Yes, I will
○ No, I will not
○ I do not know

Q.8 **Did this co-design process outcome meets your emotional needs and expectations?**
○ Yes, it did
○ No, it did not
○ I do not know

Q.9 **Do you think that the coffee table with an upgradeable appearance makes its usage *funnier* than the previous one?**
○ Yes, I think so
○ No, I do not think so
○ I do not know

Q.10 **Do you think that the coffee table with an upgradeable appearance makes it more *attractive* than the previous one?**
○ Yes, I think so
○ No, I do not think so
○ I do not know

Q.11 **Do you think that the coffee table with an upgradeable appearance makes it more *interesting* than the previous one?**
○ Yes, I think so
○ No, I do not think so
○ I do not know

Q.12 **Do you think that the coffee table with an upgradeable appearance makes it more *pleasing* than the previous one?**
○ Yes, I think so
○ No, I do not think so
○ I do not know

Q.13 **Do you think that the coffee table -which has been co-designed with some users to be aesthetically upgradeable- makes it more *trustable* than the previous one?**
○ Yes, I think so
○ No, I do not think so

○   I do not know

Q.14   **Do you think that the coffee table -which has been co-designed with some users to be aesthetically upgradeable - makes it more _positively surprising_ than the previous one?**

○   Yes, I think so

○   No, I do not think so

○   I do not know

Q.15   **Do you think that the coffee table -which has been co-designed with some users to be aesthetically upgradeable - will _delay your next purchase_?**

○   Yes, I think so

○   No, I do not think so

○   I do not know

Q.16   **How do you evaluate this coffee table design concept according to your expected experience with it comparing to the previous table?**

___

Section 3: Qualitative overall opinion

After comparing the upgradeable coffee table design concept (Please, watch the video before rating), and your previously experienced coffee table;

Q. 17. Would you please rate (0-3.5) both of them according to the expected evoked emotions by marking your appropriate rating value?

▬ **Previously Experienced Design**   ▬ **Upgradeable Coffee Table Design**

	0	.5	1	1.5	2	2.5	3	3.5
-First impression	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Happiness	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Interest	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Surprise	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Trust	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Boredom	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Attraction	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Pleasure	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Expectancy	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐
-Overall expected Experience	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐

If you have any other comments or questions, such as: **How far this questionnaire explores your expected experience?** Or, anything else you would like to add. Then, please write them in the text box below.

Thank you for completing this survey

This part of the dissertation contains the different references and cited readings and publications that have attributed the research.

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