Aluminum Furniture, Meaning and Emotion

The importance of semantics and emotional response in the design of aluminum furniture.

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ABSTRACT

The aluminum industry has since the end of the second world war been actively trying to popularize aluminum furniture as an additional outlet for raw aluminum. In order to increase the popularity of aluminum furniture, particularly within the home market, I have begun the development of a design strategy called Reflective Response. This strategy is founded in the principles and theories of emotional design and product semantics, as well as my own research into the appraisal processes of aluminum furniture. Emotional design emphasizes the underlying psychological process involved in every product experience, and quantifies the product experience into it's aesthetic, cognitive and emotional constituents. Product semantics places the design process into a communication context, and enables a more efficient transference of meaning to the user. The Reflective Response strategy is intended to induce a reflective cognitive response in the user through the use of a visual and tactile alphabet. In this article, the strategy is applied to the design of aluminum furniture, but it is likely that it could be adapted to fit any area of design endeavor.

KEYWORDS: Aluminum, furniture, semantics, emotion, design, communication, feelings, evolutionary psychology,

1. INTRODUCTION

The use of aluminum as a production material has been soaring over the course of the last century. Since aluminum was first refined by german Friedrich Wöhler in 1827 (1) the yearly production of the material has risen to more than 60 million metric tons. And by the year 2020 that number is expected to reach 97 million metric tons (2). This huge increase in produced aluminum is the result of a large availability (8% of the earth's crust consists of aluminum), technological developments in production and praised material properties (strong, lightweight, highly conductive). These factors have allowed aluminum to expand into many different fields of production. But despite the success of aluminum in many markets, it has not been able to become popular in the furniture industry, particularly outside of the contract market.

Aluminum with its low weight, high strength and flexibility of production seems like an ideal material for many furniture applications, so why is aluminum not a more popular material for furniture? A part of the answer can be found in Michael Ashbys book *Material Design, The Art and Science of Material Selection in Product Design*, which states that *"When many technically equivalent products compete, market share is won (or lost) through its visual and tactile appeal, an exploration of other senses or emotional connection, the associations it carries, the way it is perceived and the experience it enables*" (3, p. 4). Despite the fact

that aluminum is a "technically superior" material for many furniture applications, it seems that the market has been reluctant to embrace the material. This development can be explained in part by the aesthetic appearance of today's aluminum furniture, its associations and the emotional response it creates in the users. Said bluntly; the look, feel and associations of most aluminum furniture fails at making people feel good.

In this article, I will give a brief account of the concepts of semantics and emotional design which are relevant for the design and production of aluminum furniture. I will also report the findings from a series of interviews, designed to shed light on the process of appraising aluminum chairs. The theories described, and the insights gained in working with the article will then serve as the foundation for a design strategy, for creating aluminum furniture which induces positive emotional responses. I will then report my own experience of applying the design strategy, in the process of creating a series of aluminum furniture**.** The motivation for doing this comes from an initiative from aluminum producer Norwegian Hydro, who have contacted NTNU's Department of Design in order to encourage the use of aluminum within furniture design.

2. THE HUMAN COGNITIVE SYSTEM

As humans, we are emotional beings. Our emotional system is an essential part of our consciousness. Traditionally human emotions have been viewed as primitive, animalistic and irrational, as opposed to human cognition which has been considered rational, logical and more suitable for decision making. But new studies reveal that our emotions are not just an irrational and primitive level of our brain. But an essential part of our consciousness, highly intertwined with our cognition and indispensable in both our conscious and unconscious decision making. (4)

Donald A. Norman is a renowned researcher within the field of human-centered-design. He has written two of the defining books concerning emotional design, namely "Design of Everyday Things" and "Emotional Design: Why We Love (or Hate) Everyday Things". (5,4) According to Norman, the human brain operates at three different levels of processing. Two of which are subconscious; the visceral and the behavioral level, and one is conscious; the reflective level. These levels of operation are very different from each other, and they have a profound effect on how we interpret, interact with and respond to the products around us.

2.1 Visceral level

The visceral level is the most primitive one, and is considered the lowest level of processing. (4) This is an automatic and unconscious level where rapid judgments are made, based on sensory input and predispositions. The visceral level operates through what is called pattern matching, in order to determine what is the appropriate response. This level of the cognitive system is very fast, and requires almost no cognitive processing – signals are sent to the motor system (muscles) almost instantly, in order to prepare for action. For example if we see something which the visceral levels interpret as potentially dangerous, it will react immediately by producing an anxious feeling in the whole nervous system, tightening the muscles to prepare for action, and by alerting the behavioral and reflective levels of the brain to focus their attention on the source of the danger.

The visceral level is where initial reactions are formed, based on a limited set of aesthetic information. It "judges the book by it's cover" and produces an immediate emotional response. When we perceive something as "pretty", that judgement comes directly from the visceral level, Norman states.

2.2 The behavioral level

The behavioral level of the brain is where most of our behavioral actions, such as walking or driving are processed. This is an unconscious level which can work independently of the reflective level in many situations. As long as the tasks as easy and intuitive, we can perform them without reflecting on what we are doing (4). However, when some part of the behavioral process is no longer intuitive, the reflective part of the brain needs to be contacted. One example of this could be walking. As long as we know

where we are going and there are no immediate obstructions, then the act of walking is considered automatic, and does not require the support of the reflective level of the brain. But, as soon as an obstacle arises then we must use our reflective level in order to make decisions.

Our brain creates an internal mental model of the external world and how it works. This model is based on all the available information gained through all three levels of cognition. The behavioral level is able to act independent of the reflective level as long as the mental model matches the experience. If, however there is a mismatch, then the model will have to be revised, which requires the use of the reflective level.

2.3 The reflective level

The reflective level of the brain is the only non-automatic level (4). This is the only part of our cognition that we are able to directly and mindfully control. This is where we reason and achieve understanding, but it also the realm of our worries and concerns. The reflective level is able to override the other lower levels, thus enabling us to decide upon and perform actions. The reflective level is also where we are able to review memories, and compare current and past experiences. It has a longer timeframe than the lower levels, enabling us to reflect upon our experiences long after they have happened, or before they might occur. Through the use of our memory we can even remember childhood experiences. One of the side effects of this long timeframe of the reflective brain is that once we have formed an opinion about something; it usually sticks.

2.4 Bottom-Up / Top-down

The understanding of the different layers of the brain and how the cognitive system works enables us to differentiate between activity. Brain activity which is initiated by the visceral level is called bottom-up, this activity is driven by our perceptions, and later activates our behavioral and reflective level. Brain activity which is initiated by the reflective level is called Top-down. This activity is driven by reflective thought, and later activates the behavioral and visceral level (4, p. 25).

When we experience the world, we experience it through all three level of cognition, and each of the levels affect the others. Our visceral responses are usually much faster than our reflective and behavioral responses. As a result, the reflective and behavioral response will usually be affected by and biased to confirm the initial emotional response produced by the visceral level.

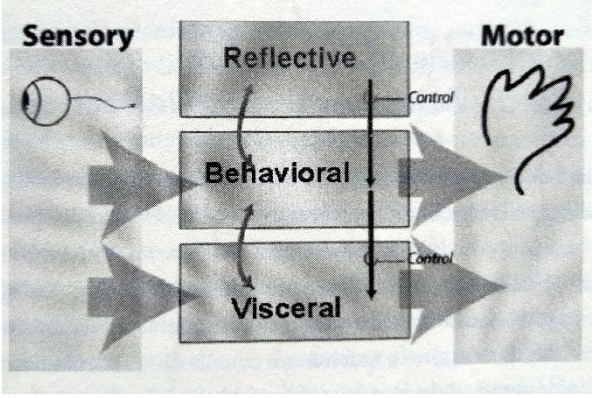

Figure 1: The Three Levels of Processing (4, p. 22)

Aluminum furniture often has good technical properties regarding strength, weight, formability and durability, but it seems like the material scores badly when it comes to perceptual (aesthetic) evaluations of the furniture. It follows that aluminum furniture would be more favored by users applying a top-down-evaluation-process, compared to a bottom-up-evaluation-process. However, furniture-evaluations are usually bottom-up-processes, we first see the furniture and perceive it's visual, aesthetic qualities, then tactile and reflective evaluations are made. In some cases, we would not even consciously note the visual appearance of a chair before we are sitting on it. In these cases, our initial response will still be aesthetic, but it will be based on the tactile sensation of sitting in the chair rather than the visual sensation of looking at it.

3. EMOTIONAL DESIGN

"Beyond the design of an object, there is a personal component as well, one that no designer or manufacturer can provide. The objects in our lives are more than mere material possessions. We take pride in them, not

necessarily because we are showing of our wealth or status, but because of the meanings they bring to our lives." (4, p. 6)

Emotional design represents many things; it is a (relatively) new way of looking at factors crucial to product and furniture design, such as the psychology behind our product experience, and why we make the choices we do. Emotional design is also a toolbox, with theories and guidelines that can be applied to all stages of the design process.

3.1 Three aspects of a designed object

Corresponding to the 3 different levels of the brain, Donald Norman (4) also distinguishes between 3 different aspects of design; The visceral - which relates to the appearance of a product, the behavioral – which has to do with how a product is used, and the reflective – which concerns itself with the rationalization and intellectualization of a product. These three aspects of design fuse the emotions and cognition together, and are present in every designed object.

If a product takes a lot of time and cognition to "understand", then the initial lack of understanding might have already triggered a negative emotional impact towards the product. It is rare that conscious evaluation of a product is able to change an initial emotional response. If a product takes a very short time to "understand" and the material of which it was made (aluminum) was part of that understanding, then that increases the likelihood of achieving a positive emotional reaction towards the product as a whole, and towards its material.

3.2 Product Experience

In his 2006 article *Design aesthetics: Principles of Pleasure in Design* professor of form at Delft University of technology Paul Hekkert defines a product experience as:

"*The entire set of effects that is elicited by the interaction between a user and a product, including the degree to which all our senses are gratified (aesthetic experience), the meanings we attach to the product (experience of meaning), and the feelings and emotions that are elicited (emotional experience)." (6, p. 160)*

In this Hekkert divides the product experience into three separate components that are conceptually different:

1. The aesthetic component
2. The cognitive component
3. The emotional component.

The division between these components is beneficial because it gives conceptual clarity. Looking at the underlying, psychological processes of the product experience enables us as designers to more accurately pinpoint certain parts of the experience which can be approved upon. But the separation of the components on a phenomenological level can be very difficult, because the different components of the experience are so highly entwined that it can be problematic to separate and identify them.

3.2.1 Aesthetic experience

The aesthetic experience is the component of our experience that emerges directly from sensory information, as opposed to the brains cognitive and emotional responses to sensory input. Hekkert argues that *"we aesthetically prefer environmental patterns that are beneficial for the development of the senses"* – and he bases this argument on the principles of evolutionary psychology.

3.2.2 Cognitive experience

In addition to the sensuous delight or dismay that emerges from the aesthetic experience, most product experiences will also include the cognitive and emotional component. The cognitive component of the experience is where we consciously or unconsciously evaluate, understand and attribute meaning to the product. Cognitive processes such as interpretation, retrieval from memory and associations are central in this process.

3.2.3 Emotional experience

Most experiences also carry with it an emotional response; seeing a beautiful sportscar might make us feel desire, while the sight of an expert chef preparing a meal might make us feel hungry, but why is this? According to Hekkert, the best way to accurately describe the

processes leading up to an emotional response is to apply the appraisal model (6).

The appraisal model states that our emotional response emerges from an appraisal (evaluation) of the situation (product) and the potential effect it might have on us. Experiences that are appraised to be positive for our concerns will elicit positive emotions. Likewise experiences that could have a negative effect on our wellbeing will elicit negative emotions. When the potential effect on our wellbeing is unclear, the emotional response will be more ambiguous.

Norman states that *"...everything you do has both a cognitive and an affective component – cognitive to assign meaning affective to assign value." (4, p. 25)* Our affective state could be described as how we feel about a situation, and it changes the way our cognition operates. If we are in a state of negative affect we are more likely to tense our muscles and focus in on what seems to be causing the negative affect until we can resolve the situation. This is a survival instinct designed to relieve us from eminent dangers. Reversely, if we are in a state of positive affect, we are less likely to focus our attention on problems, and more likely to relax our muscles, broaden our reflective and associative scope, and to explore new possibilities. How a certain experience is appraised will always be different, and is based on the personal concerns of the individual as well as how the experience is interpreted.

4. PRODUCT SEMANTICS

Semantics is the study of meaning in language (7). The goal of semantics is to achieve increased clarity and understanding in communication. In other words; ensuring that the linguistic meaning, which is interpreted by the receiver, closely matches the intended meaning of the sender.

Over the course of human history, we have developed a vast array of different languages with which we can communicate. The written languages, such as written English, Bokmål and different types of computer code are perhaps the most unambiguous. These languages are well defined systems built up by signs (letters), symbols (words) and a complex set of rules. We also have dictionaries that define the meaning of the symbols and enables us to translate between different languages.

The oral languages are more ambiguous, because they often include components such as dialect, tone of voice and body language which are not strictly defined, opening up for more possible interpretations. A famous study conducted by Albert Mehrabian in 1971 suggested that 38% of the meaning extracted from conversations are attributed to the tone of voice and 55% to body language, leaving only 7% to the actual words (8).

Language itself is nothing more than a means for communication, and could easily be expanded upon to include other methods than the written and spoken words, such as product design. Whether consciously or not, all design is conveying some sort of message to the user. It would be natural to expand the field of semantics to include the study of meaning in *all* possible methods of communication, including product design.

Linguistic semantics utilizes specifically defined letters and words that are arranged according to predefined rules within the chosen language, thus it is very efficient at conveying a specific meaning. Product semantics, on the other hand utilizes a different set of signs and symbols in order to convey meaning. It applies a visual and tactile "alphabet" of shape, color, material, texture and form. Communication through product design is usually more abstract, and allows for a greater degree of interpretation on the part of the receiver (9). But it is also possible to incorporate both written and oral languages in product design through the use of text or loudspeakers.

4.1 The four components of communication

Most theories of communication divide the communication process into four essential components; a *message*, an *output*, an *input* and a *response*. The components of communication always appear in a linear manner, with the message first and the response last. For the communication to be considered successful, the response should closely match the message

(10). This holds true for all languages, including visual and tactile ones.

4.2 Product communication

The study of product semantics enables designers to more efficiently transfer the intended meaning to the user of a product. By looking at design as a language of communication we are able to more clearly understand what we are trying to say as a designer, as well as making sure that the intended message is transferred to and understood by the user (9).

Let us now look at the components of communication in the context of product communication.

4.2.1 The Message

The message in classical communication theory corresponds to the intended design function. In other words; what is the intended purpose of the object, as articulated by the designer? This is of outmost importance. If the person who is designing the product is not conscious of what message he or she is submitting, then the subsequent response of the user will be quite arbitrary and often negative. Therefore, the designer should throughout the design process place special emphasis on defining the message of the product.

4.2.2 The output

The output in product communication represent the object or product itself. In order for the communication to be clear and efficient, the designer must translate the message into a convenient form, which can then be deciphered and interpreted by the user. In product design this is done by applying a tactile and visual alphabet in order to build a statement that holds the same meaning to both the designer and the user. This is very difficult to achieve, as the tactile and visual alphabet used is ambiguous, and lacks clear definitions (9).

4.2.3 The input

This is the phase where most product communication processes break down. Firstly, it's not always certain that the input received by the user is the same as the output from the designer. In some case the design is adapted and changed to facilitate efficient manufacturing and distribution, causing a mismatch between output and input. Even if the input received matches the output, there can still be misunderstandings, due to a lack of a shared language. Most products communicate mainly through a visual and tactile language, the contents of which can be hard to decipher for the uninitiated. Since the designer and the user usually does not share the same, knowledge, experience and cultural background, misinterpretations frequently occur.

4.2.4 The Response

If the input is both received and correctly interpreted, there is still a chance that the user response is not as expected. This is due to the context in which the product is used, which will always be a little different from the context in which it was designed, resulting in variations in meaning.

Being aware of the different components of product communication, as well as how they might break down, enables the designer to more efficiently transfer their intended meaning to the recipient.

5. METHODOLOGY

The main methods of data collection for this article have been through literature review and a series of interviews (n=12), as well as workshops and lectures held at the NTNU Aluminum Product Innovation Center (NAPIC).

The early part of the literature review process was focused on the properties, design, production and use of aluminum furniture throughout the 20th century. This early review process led me to believe that one of the main problems concerning aluminum furniture is regarding to how it is interpreted emotionally. This led me to begin research in the field of emotional design, and from there I ventured into semantics.

The interviews were conducted towards the end of the information gathering phase and the goal was to achieve a better understanding of how people appraise aluminum furniture. The

interview process was inspired by the interviews conducted by Patrick W. Jordan in his article *Human Factors for Pleasure in Product use* (11), and followed a similar pattern. The questions from Jordan's interview were adapted to concern the visual first impression of aluminum chairs. Twelve interviews were conducted, each lasting about 30 minutes, and the participants were students between 20 and 29 years old. At the beginning of each interview the participant were shown 10 pictures of aluminum chairs, and asked to rank the chairs from 1 to 10 according to how pleasurable they found them. Then followed a semi-structured interview exploring the positive and negative aspects of each chair, to determine how they appraised the furniture, what emotion that appraisal led to, and which design elements and personal concerns were most crucial in the formation of their appraisal. Towards the end of the interview the semi-structured approach would dissolve to give way for a more open discussion, and allow the participants to speak freely about their reactions to the pictures.

In the development of a new series of furniture, intended to promote positive emotional responses, I also explored through sketching, writing, 3D-modelling and prototyping in several iterations.

6. INTERVIEWS

Preliminary discussions as well as my research into aluminum design history had suggested to me that one central problem with much of the aluminum furniture available today is that it fails to put its users in a state of positive affect when they see the object. And some of the aluminum furniture that is out there actually seem to put people in negative affect just by looking at the objects. However, these theories were not founded in scientific research. In order to achieve better insight into how we appraise aluminum furniture, I conducted a series of interviews. The participants were asked to rank aluminum chairs, and through the interview we explored the mental processes underlying their appraisal.

The scores of the different chairs were later summed to reveal which chairs were most preferred by the participants. An interesting observation which I made during the interview process was that although the ranking of the chairs varied a lot, the spoken explanations of which attributes were thought to be positive and negative, were quite consistent between participants. This enabled me to arrange the results from the interviews into two lists of attributes; one with attributes that were positively appraised and one concerning the negatively appraised attributes.

Attributes leading to positive appraisal:

- Holistic appearance
- Comfortable appearance
- Intriguing appearance
- Sturdy appearance
- Understandable construction
- Reliable
- Faceted reflection of light

Attributes leading to negative appraisal:

- Many parts
- Flimsy appearance
- Uncomfortable appearance
- Chaotic appearance
- Sharp edges
- Unreliable
- Incomprehensible construction

The interviews provided me with a valuable understanding of the appraisal process of aluminum furniture, as well as how we can affect it positively. It also strengthened my belief that much of the aluminum furniture sold today fails to put users in a state of positive affect, as the chair which had the worst appraisal score in the survey was also the type of chair that the participants deemed to be most commonly seen.

Figure 2: Outdoor Aluminum Chair received the lowest appraisal score in the survey.

The Aluminum Chair by Tobias Labarque (below) received high appraisal scores by the participants in the interview, but the real communicative marvel of this chair did not reveal itself until later in the interviews. When asked about what attributes had led to their appraisal of the chair, almost all the participants answered that they liked that the chair was folded from a single sheet of metal. The communicative feat of this chair lies in its ability to tell the story of how it was produced from a single perforated sheet of metal, and forcefully folded and bent into a shape suited to comfortably seat the user. This story is told through the chairs appearance and understood by the participants in the interview.

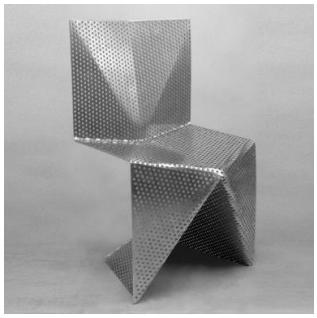

Figure 3 Aluminum chair by Tobias Labarque

7. STRATEGY: REFLECTIVE RESPONSE

The research for this article has given many new insights in the fields of semantics, emotional design and appraisal theory. It has provided a better understanding of attributes which can induce or dissuade positive appraisal. On this basis I have begun to develop a design strategy for designing positively appraised aluminum furniture. This strategy is meant to be applied within the framework of emotional design and semantics.

The first, central and overreaching element of the strategy is to pursue a reflective (top-down) response in the user, as opposed to a more visceral response. There are several measures that a designer can make in order to inspire a top-down-thought-process. To achieve this one should view the design process as a part of a process of communication with the user. Providing the user with clear visual indicators, showcasing the objects production method, is one way to inspire an initial reflective response through offering the user to understand it's fabrication. Another alternative would be to incorporate written language into the furniture, as written language can only be deciphered by the reflective level of the brain. Designers must be conscious of *what* they are trying to say through furniture, as well as *how* they are saying it. They need to anticipate the different interpretations and responses which might arise from their product communication. By being aware of the four components of communication and responding to the user's emotional needs, we can create furniture that effectively transfers the indented message and elicits favorable emotional responses.

Figure 4: The Hidden Shaker Chair by Ibride

As an example of a furniture which effectively induces a reflective response, I have included a picture of The Hidden Shaker Chair (above). This chair is a visually and physically distorted piece of furniture, but when viewed from one particular angle the chair becomes an undistorted image of a shaker chair. The reflective act of realizing this and finding the angle from which the chairs undistorted image appears will usually result in a feeling of accomplishment, discovery and positive emotions. The purpose of the object reaches beyond the utilitarian, this chair is designed to inspire curiosity, conversations and positive emotions of discovery, rather than just the visceral appeal of something beautiful. To me, the message of the Hidden Shaker chair is that "The way which we look at something changes what we see.", but it is the clever conveying of this message which makes the object so interesting.

The Second element of the strategy involve applying those attributes which have been found to induce positive appraisal, and avoiding those that have been found to dissuade it. Some

of these attributes were described in section 6., but this list is by no means exhaustive and should be tested and expanded upon through further research. The application of this second element must to be made with thoughtfulness and consideration to the furniture as a whole, including its semantic meaning, and the reflective response which it is meant to induce.

8. CASE: FOLD

In order to demonstrate how the design strategy can be applied, I have designed a series of aluminum sheet furniture. The furniture pieces are intended to create a reflective (top-down), response in the user. This was achieved using semantic principles of communications, applied through the use of a visual, material and tactile language. I wanted the users of the furniture to experience a feeling of understanding and avoid any negative feelings of alienation.

The sematic model emphasizes the importance of creating a clear and unambiguous line of communication, which starts with a clearly articulated message. What message I wanted to articulate was therefore of outmost importance, but finding that message can be difficult. I knew that I wanted the line of furniture to activate the reflective level of the brain, and induce some sort of understanding in the receiver, but I did not yet know what I wanted them to understand. It was clear to me that the message needed to concern aluminum, I wanted my objects to articulate that aluminum is a relevant material from which to create furniture. So, In order to find the exact message I started studying lots of aluminum furniture and tried to decipher *their* message. I also began ideation and sketching, and systematically listing my likes and dislikes concerning different aluminum furniture. Through this process I decided on the following message which I wanted to convey;

The message of Fold is the story of how each piece of furniture is manufactured from a single square piece of aluminum, through simple cutting and bending, without the use of any additional elements. It is also the story of how the aluminum as a material enables this manufacturing process through its malleability and strength.

Once the message had been clearly articulated, the process of translating it into physical form became much easier, as I could always look to the message as a guide.

The application of the design strategy provided direction and intent to the process of designing the line of aluminum furniture.

9. DISCUSSION

Although I feel that I have made a thorough study of the importance of semantics and emotional response in the design of aluminum furniture, the study does have limitations which are important to acknowledge. These limitations also serve as opportunities for further exploration.

Emotional design and semantics serve as the theoretical foundation of this article. Both of these fields of study are deeply embedded in psychology, thus it would be beneficial to include more literature on general psychology. The absence of further study into psychology as well as my lack of prior knowledge in this field, will have had a limiting effect on my discussion.

In the work with this article I have begun developing a strategy to design positively appraised aluminum furniture. This strategy includes pursuing a reflective (top-down) cognitive response by use of product semantics, applying the attributes which were found to induce positive appraisal, and avoiding the attributes which induced negative appraisal. In order to verify and expand upon this strategy, further research is needed:

- How the use of colors, surface finish and combination materials affect the appraisal process of aluminum furniture seem highly relevant, and should be included in further research.
- Verifying that the suggested strategies actually work, requires more data and further research. This could be done by the use of evaluation and comparison studies.

It is important to note that the suggested strategies should be viewed as general

guidelines, which needs to be applied with discretion and thoughtfulness to the holistic expression of the furniture.

10. CONCLUSIONS

In this article, I have explored the fields of emotional design and product communication, within the context of aluminum furniture. The process has been one of continuous learning, further exploration and application, which has emphasized the importance of these fields of study. I have learned that in order to create aluminum furniture which elicit positive user experiences, the designer must understand how our human mind appraise the experiences in our life on an emotional level. As well as how we, through the use of semantics, can create products with real meaning, streamline our method of communication and elicit appropriate responses from the users. The development of the Reflective Response strategy applied to the production of aluminum furniture, could be of benefit to the aluminum industry's effort to gain shares of the furniture market.

Throughout this article, the theories and concepts described have been in the context of aluminum furniture, but that does not mean that they are not applicable outside of this realm. The theoretical foundation of the Reflective Response strategy is universal, and with further research and development, the strategy could probably be applied to any field of design endeavor.

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FIGURES:

Figure 1:
The Three Levels of Processing
Norman, D. A. Emotional Design Why We Love (or Hate) Everyday Things. New York: The Perseus Books Group; 2004, p. 22.

Figure 2:
Outdoor Aluminum Chair by unknown designer.
http://www.barstoolsandchairs.com/outdoor-aluminum-chairs.aspx

Figure 3:
Aluminum chair by Tobias Labarque
http://www.contemporist.com/aluminium-chair-by-tobias-labarque/

Figure 4:
The Hidden Shaker Chair by Ibride
https://www.dezeen.com/2013/01/28/the-hidden-chairs-by-ibride/

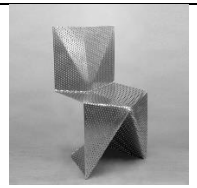
APPENDIX 1

Pictures of chairs used in interviews

APPENDIX 2

Ranking of aluminum chairs according to how pleasurable they are

10 = most pleasurable
1 = least pleasurable

										
Participant 1	3	8	10	2	9	7	6	1	4	5
Participant 2	6	10	3	4	5	8	1	7	9	2
Participant 3	8	3	9	1	10	5	6	7	4	2
Participant 4	4	7	8	3	9	2	1	5	6	10
Participant 5	7	6	8	3	1	5	2	9	10	4
Participant 6	2	6	7	1	10	4	8	5	9	3
Participant 7	5	10	8	3	7	9	1	6	4	2
Participant 8	4	8	9	2	10	7	6	1	3	5
Participant 9	2	7	9	1	10	5	6	8	3	4
Participant 10	5	10	3	8	6	9	2	4	1	7
Participant 11	2	8	10	1	9	7	5	6	4	3
Participant 12	2	9	7	1	8	10	3	5	4	6
SUM	**50**	**92**	**91**	**30**	**94**	**78**	**47**	**64**	**61**	**53**