Emotion, Affectivity and Usability in Interface Design

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Abstract. The intent of this paper is to provide an overview of the influence of emotion, affection and feelings during the contact between users and interfaces. Definitions of each of the aspects and relations established between them, and perceived usability and user satisfaction are presented. It was concluded that the process of interface design should include analyzes of the context, objectives and specific features and requirements.

Keywords: emotion; affectivity, usability, interface design.

1 Introduction

This paper presents aspects of human cognition and discusses their impact on human - technology interaction.

Every day we formulate complex judgments about people and objects with which we interact, expressing different emotions to different situations. The impact caused by our sensations, emotions and perceptions can directly affect our interest in using a product or system, their usefulness in estimating and evaluating their. Thus, an individual becomes fruit of their internal complexity, influenced by the world around him/her and the impact of material and affective experiences that help to create their own identity set your impressions and preferences.

A product or system may have different features that can be classified into three red categories [8]:

- practical function: relation at the physiological level, established from the initial contact of the object with the human senses;
- aesthetic function: relation in the sensory level, the perception of the object during its use. Here, the proper development of the aesthetics of a product can improve the perception of performance and contribute to the vested interest of the consumer / user;
- symbolic function: relation establishing connections with the experiences and sensations ever experienced by the user, determined by the acquired psychological and social aspects. Derives from the aesthetic elements contained in the product that create associations with ideas (memory status, satisfaction, pride).

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In order to systematize the types of product configurations use, Lobach (2001) proposed two principles:

- the practical-functional: the products in which predominate objective, utilitarian relationship;
- functional: the products in which there would be a predominance the subjective relationship of signification.

It is noteworthy that, historically, research and development in design always allocated more attention to identifying practical and objective needs of users than the emotional, psychological, social and cultural needs of users during the design of a product or system. This often happens because usually the designer works during the design process in order to "idealize" users and their characteristics without actually making contact with them [8].

2 Emotion Design

Over time, the needs of individuals become more dynamic, amplified by factors related to product use (ergonomics) or cultural and velocity information and the generation of new products and services. Some authors justify the existence of a wide range of industrial artifacts and their variations thanks to the emergence of new human needs, in which "the range of products offers consumers a degree of choice and gives them sense of individuality" [6]. It is noteworthy also that the products can be more than the sum of their duties, satisfying certain emotional needs in people [9].

In humans [7], emotions are essential elements of life, being crucial for making everyday decisions. Interact through them to the stimuli received in the world, helping to assess situations as being good or bad, safe or dangerous [9]. And in contemporary society marked by consumerism, products become true living, objects capable of changing our emotional state and have its own personality [7].

Maslow grouped an individual's basic needs into eight categories [1]:

- Physiological: hunger, thirst, bodily comforts etc.;
- Safety/security: being out of danger ;
- Social: affiliate with others, be accepted;
- Esteem: to achieve, be competent, gain approval andrecognition;
- Cognitive: to know, to understand, and explore;
- Aesthetic: symmetry, order, and beauty;
- Self-actualization: to find self-fulfillment and to realize one's potential;
- Transcendence: to help others find self-fulfillment and to realize their potential.

From 1990s, with increasing investments in user research begins to emerge - with force on the international stage design - a field called "emotional design", which seeks to investigate and understand the role of emotions in the relationship between man and objects. Thus, enabling designers to design more efficient and unique solutions, either in the design or improvement of products and spaces physical interfaces or virtual environments, avoiding or arousing certain emotions in people from their use [11].

In the real world, emotions are neither predictable nor controllable, it is not possible, for example, the designer to add emotions to manufactured objects. But from studies investigating the emotional attachment between human and products or systems, fosters is a scientific field that seeks to formulate statements about the user experience with the product. From the investigation of emotions and other aspects of human cognition is possible to awaken or avoid certain emotions evoked during contact with the product. So emotional design [11] is rather a holistic approach to the needs and desires of the user than a mechanism for handling their experience [11].

It should be emphasized that some research that have been developed in recent decades have brought important contributions to the theories and proposed new field of emotional design:

2.1 Donald Norman and the Three Levels of Design

Among all animals, we humans are more complex: brain structures that possess and enable us to respond to stimuli in the world we live in, give us the amazing ability to reflect on it and what we learn from such experiences and thus evolve and overcome biological inheritance [9]. Thus, according to Donald Norman theory, there are three levels of processing of the human brain, operating continuously in our relationship with objects. Transporting levels for the universe of design, it suggests specific strategies in order to work with each of them in particular ways.

- visceral level: preconscious automatic layer, linked to the appearance in which form first impressions about the object. This layer is related to physical aspects (physical sensation, texture and weight of materials) and the first impression of a product;
- behavioral level: the layer that controls the behavior that is related to the use and performance of the object or system. It is also associated with function, ease of understanding of the product, usability and how it is physically felt by the user, and effectiveness and efficiency;
- reflective level: conscious and contemplative part of the brain that considers the rationalization and intellectualization of something. It is related to a subjective point of view, covering cultural and individual characteristics, affective memory, construction of meaning, self-image, personal satisfaction, memories. Designing this level requires embedding meanings to products such as pride and satisfaction.

It is noteworthy that our interaction with objects of day-to-day [9] reflects the three levels of design in many different ways: some objects are enjoyed only by the visceral impact of its appearance (visceral design), others worshiped solely by their function and use (behavioral design) and others to create an image of self-confidence, identity, fun (reflective design). The levels comprise human brain structures ranging from the lower layer (sensory) to more complex and higher (reflection). There is a temporal issue: the visceral and behavioral levels reflect the "now"; the reflexive can extend much longer, providing long-term relationships, deeper and long lasting [9].

In developing a product a designer should keep in mind that any real experience involves all three levels, and there should be a balance of forces, where each level

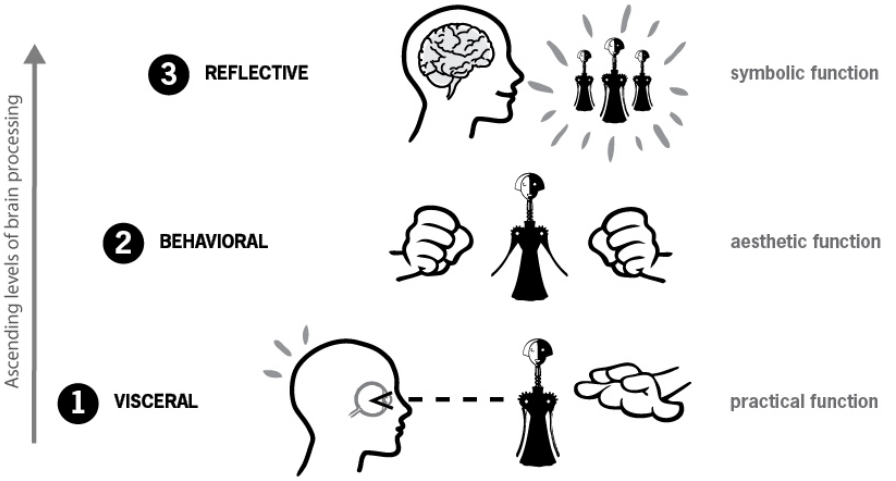

Fig. 1. Levels of brain processing and their functions

has a different role in intellectual functioning, each requiring a different approach for this professional design. The three interacting components, modulating each other and combine the same time, emotion and cognition [9].

2.2 Patrick Jordan and the Four Pleasures

Humans are always in the search for pleasure, and the artifacts they use can be considered as sources of pleasure [7]. In his book "Designing pleasurable products", Patrick Jordan [7] establishes a relationship between pleasure and the use of the product, seeking to understand how people relate to the products, and what kinds of pleasure arises from that relationship. According to the theory of Jordan [7] products may show four types of pleasure from its use:

- Physiological Pleasure. Related to the body and the senses: touch, smell, hearing, sight, and taste, in addition to sensual pleasure;
- Social Enjoyment: related to the pleasure derived from the interactions between humans, and how these products act as facilitators and motivators in these social relations;
- Psychological Pleasure: concerning reactions and psychological state during interaction with the product. The success in performing tasks or in finishing it ends up generating states like excitement or relaxation;
- Ideological Pleasure: related to reflection on experience, and the combination of the person's values (moral values) with the values embedded in the product (cultural values).

The model proposed by Jordan suggests a systematic classification of sources of pleasure in order to assist designers in their projects. Besides contributing to the understanding of how design can awaken pleasure in people, their research also

influenced the development of methodologies and techniques for professionals [10]. According to this theory the needs of users on the products go through a hierarchy of levels that need to be satisfied, starting at the lowest point "functionality" (what one expects the product to comply), through the middle level "usability" (the ease in using such a product) until you reach the apex of the needs that would be the "pleasure" (maximum stage that goes beyond functionality and usability - creating a deeper relationship between user and object).

From the above theories and seeking a better understanding of the topic it is shown below a comparative framework that seeks to relate the authors from an order of events: the functions displayed by the products in contact with the user will interact with certain levels of processing in the human brain that require the different design strategies.

Table 1. Relationship between the functions of the object, brain levels and types of pleasure

Löbach	Norman	Jordan
practical function	visceral level	physiological pleasure
aesthetic function	behavioral level	social enjoyment
symbolic function	reflective level	psychological / ideological pleasure

Perception. Perception is the process by which people decode the stimuli (information) received through the five senses (touch, smell, sight, hearing and taste). Our perception is conditioned by social influences, as well as the physical and psychological conditions that surround us. Perception determines what is seen and what is felt, influencing our buying behavior. The perception tends to be a selective process, as we cannot be aware of all inputs simultaneously. Since humans are bombarded by messages you see and hear on a daily basis, it tends to select almost intuitively what interests you most, conditioned by the social and cultural environment for their physical and psychological [3] conditions.

Sentiment. Sentiment is also often confused with emotion. Unlike emotions (and moods) [1], sentiments are not states of an individual, but assigned properties of an object. When people say that they “like” an interface or find an interface to be “frustrating,” what they really mean is that that they associate the interface with a positive or frustrating emotional state; in other words, they expect interaction with the interface to lead to positive or frustrating emotions [1].

Memory. Emotion’s effect on attention also has implications for memory. Because emotion focuses thought on the evoking stimulus, emotional stimuli are generally remembered better than un- emotional events [1].

Color. Can clearly be designed into an interface with its mood influencing properties in mind. Warm colors, for example, generally provoke “active feelings,” while cool colors are “much less likely to cause extreme reactions” [1].

Sound, Voice and Music. Aspects of audio such as timbre, pitch and speech rate, instruments, rhythm and melodies of songs and background envelope, frequency and duration of sounds for the warning and audible feedback can interfere with the perception of the users towards the system and the experience of user.

Gestures. Models and patterns of gestural interfaces when designed properly can facilitate the use of a system and contribute to a positive perception and acceptance of the system by users - making it more enjoyable and intuitive to use and increase overall user satisfaction during interaction with the system.

Typography. The choice of typography can contribute positively or negatively both in speed reading and understanding the message and perceived credibility. For example, an annual report on the sales of a company written in sans comics can interfere with the credibility of the document. Also, characters in smaller size may require more effort users to read and therefore the satisfaction when using the system.

User Experience. The user experience is the totality of effects felt internally by a user as a result of the interaction - which can start even before visual contact (due to possible expectation or idealization) [4] and also during and after the interaction - where after use reflections on lived experience occur. Therefore, the user experience is related to the cognitive, physical and emotional processes, and also depend on the context of use and variables such as temperature range of environment, lighting, noise, social relations, among others. Usability clears the way for a good experience by eliminating troublesome interface distractions, but a great experience stems from something more of an awareness of why people could or do care [1].

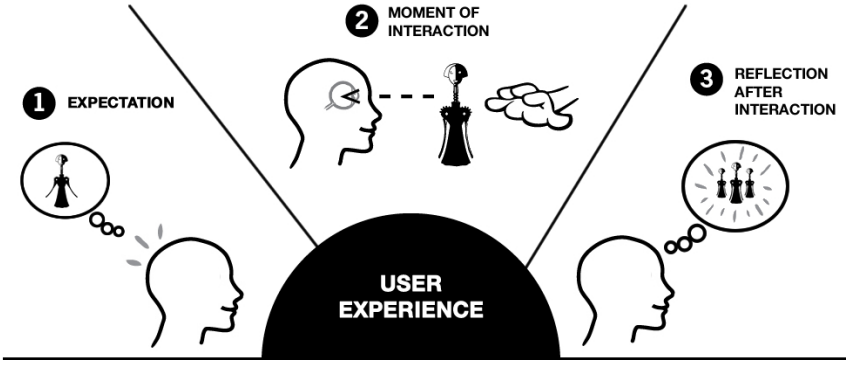

Fig. 2. Flow of user experience

Neuroergonomics. To Parasuraman [10] while Ergonomics (or Human Factors) refers to the study of the relationship between adaptation of technology to humans in the workplace and in other real-world contexts and neuroscience to the study of brain structure and function the area called Neuroergonomics focuses on research on the relationship of neural substrates of perceptual, cognitive and motor functions, such as vision,

hearing, movement, decision making and planning in the use of technologies. Among the topics and application areas Neuroergonomics highlighted by Parasuraman [10] mentioned: the interaction of humans with computers, devices and environments: at work, at home, at leisure, in rehabilitation activities, for the sake of accessibility; the use of products and operating vehicles such as airplanes, cars, trains and ships. It is worth noting, though, that both the aforementioned technological advances as the development of new research in neuroergonomics have brought contributions to the body of knowledge and theories of cognitive psychology, neurosciences and ergonomics - pushing the boundaries of what was hitherto considered as cash black (set of unobservable mental processes and not considered by behavioral psychology in the 70s).

Accordingly, in the context of interaction, perception occurs through a series of reactions to physical, psychological and emotional stimuli, where once senses and interpreted through cognitive processes of our psychology, we assign meanings things, and experiences. This process allow, for example, to qualify an experience as satisfying or frustrating. And therefore, continuous and long-term mode, which operates the same way for the construction of knowledge and world view, also acts to influence the meaning that is given to a service, product, or brand, and establish a good or bad relationship with an institution.

Therefore, when considering the interaction of the universe as a whole, the mutuality of relationships between user and context, and to project to the experience and, above all, for its quality, it is essential to consider the user's perception, the way we react to varying stimuli from the environment and interacts with a context.

3 Conclusion

The results obtained from the literature survey and the reflections made in this study suggest that there is strong relationship between systems considered by users as easy usability and suitability of the characteristics of the interfaces to aspects such as pleasure, emotion, memory and feeling. Therefore, it is recommended that the user interface is designed from surveys about cognitive, psychological, physical and cultural aspects of the users. Also that experimental research should be conducted to verify and to analyze the relationship between the aspects mentioned and usability of a system or product it is suggested.

References

1. Brave, S., Nass. C. Emotion in human-computer interaction. In: Jacko, J.A., SEARS, A. The human-computer interaction handbook, pp. 81--86. L. Erlbaum Associates Inc. Hillsdale, NJ (2003)
2. Cardoso, R. Uma introdução ao design. Blucher, São Paulo (2008)
3. Cobra, M. Vendas: como ampliar seu negócio. Marcos Cobra, São Paulo (2001)
4. Cybis, W., Betiol, A. H; Faust, R. Ergonomia e Usabilidade. conhecimentos, métodos e aplicações. 2 ed. Novatec Editora, São Paulo (2010)
5. Figueiredo, C. M., BUCICH, C.C. O conceito de prazer na relação entre usuário e o produto. São Paulo, Bauru: XII SIMPEP, São Paulo (2005)

6. Forty, A. Objeto de desejo – design e sociedade desde 1750. Cosac Naify, São Paulo (2007)
7. Jordan, P. Designing pleasurable products. Taylor & Francis, London (2000)
8. Löbach, B. Design industrial: bases para a configuração dos produtos industriais. Editora Blucher, São Paulo (2001)
9. Norman, D. A. Design emocional: por que adoramos (ou detestamos) os objetos do dia-a-dia. Rocco, Rio de Janeiro (2008)
10. Parasuraman, R. & Rizzo, M. Neuroergonomics: the brain at work. Oxford University Press, New York [2007]
11. Tonetto, L. M., Costa, F.C. X. Design Emocional: conceitos, abordagens e perspectivas de pesquisa. Unisinos, São Leopoldo (2011)