PROCEEDINGS OF THE

Design Doctoral
Conference '18
Transgression

IADE | Universidade Europeia
Lisbon, 20th 21st 22nd of June '18

Universidade
Europeia
IADE
LAUREATE INTERNATIONAL UNIVERSITIES

unidcom
+ IADE

FCT
Fundação para a Ciência e a Tecnologia
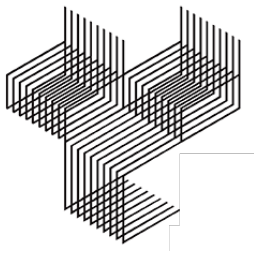
CONTENTS
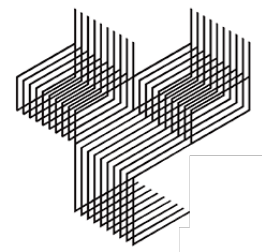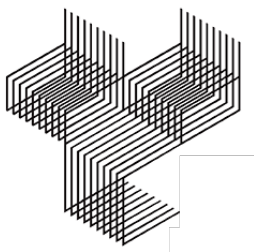
Design Doctoral Conference'18: TRANSgression
UNIDCOM/IADE, Lisbon, Portugal, June 20-22 June 2018

ORGANIZING COMMITTEE

General Chair
Emília Duarte – IADE-UE, UNIDCOM/IADE

Organization
Design PhD course
- David Camocho
- Davide Antonio Gambera
- Gaye Ayanoğlu
- Ghita Abens
- Hugo Rocha
- Ricardo Santos

UNIDCOM/IADE
- Eduardo Gonçalves

Session Chairs
Session 1
Ana Margarida Ferreira, IADE, Universidade Europeia, Lisboa, Portugal

Session 2
Carlos M. L. Rosa, IADE, Universidade Europeia, Lisboa, Portugal

Session 3
Fernando Oliveira, IADE, Universidade Europeia, Lisboa, Portugal

Session 4
Eduardo Gonçalves, IADE, Universidade Europeia, Lisboa, Portugal

Session 5
Susana Leonor, IADE, Universidade Europeia, Lisboa, Portugal

Session 6
Flávio Almeida, IADE, Universidade Europeia, Lisboa, Portugal

Design
Logo design – Paulo T. Silva, Fábrica, IADE
Graphic design – Antonio Davide Gambera, PhD candidate, IADE
Photography – Paulo Andrade, PhD candidate, IADE
Website – Bruno Nobre and Davide Antonio Gambera, IADE
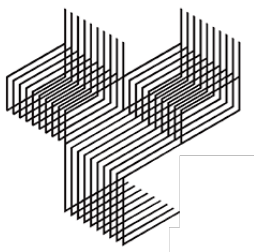
HONOUR COMMITTEE

Doctor Pedro Barbas Homem, Rector of Universidade Europeia, Lisbon, Portugal

SCIENTIFIC COMMITTEE

Agnese Rebaglio, Politecnico di Milano, Milan, Italy

Américo Mateus, Universidade Lusófona, Lisbon, Portugal

Ana Correia de Barros, Fraunhofer Portugal AICOS, Porto, Portugal

Ana Margarida Ferreira, IADE, Universidade Europeia, Lisbon, Portugal

Ana Maria Garcia Nolasco da Silva, UNIDCOM/IADE, Lisbon, Portugal

Antonio Mendes, IADE, Universidade Europeia, Lisbon, Portugal

Barbara Camocini, Department of Design, Politecnico di Milano, Milan, Italy

Carlos A. M. Duarte, IADE, Universidade Europeia, Lisboa, Portugal

Carlos Alves Rosa, IADE, Universidade Europeia, Lisbon, Portugal

Carlos Rosa, IADE, Universidade Europeia, Lisbon, Portugal

Cláudia Albino, University of Aveiro, Portugal

Claudia Mont'Alvão, PUC-Rio Pontifical Catholic University of Rio de Janeiro, Brazil

Cristina Caramelo Gomes, Lusíada University of Lisbon, Lisbon, Portugal

Cristina Pinheiro, IADE, Universidade Europeia, Lisbon, Portugal

Daniel Brandão, Design School of the Polytechnic Institute of Cávado and Ave, Portugal

Daniel Raposo, School of Applied Arts of the Polytechnic Institute of Castelo Branco, Portugal

Dina Riccò, Politecnico di Milano, Milan, Italy

Elisa Bertolotti, Art and Design Department, University of Madeira, Funchal, Portugal

Ernesto Vilar Filgueiras, University Beira Interior, Covilhã, Portugal

Fernando Oliveira, IADE, Universidade Europeia, Lisbon, Portugal

Flávio Almeida, IADE, Universidade Europeia, Lisbon, Portugal

Francesco Zurlo, Politecnico di Milano, Milan, Italy

Francisco Rebelo, University of Lisbon, Portugal

Guy Julier, Aalto University, Finland

Hande Ayanoglu, IADE, Universidade Europeia, Lisbon, Portugal

Helena Barbosa, University of Aveiro, Portugal

Inês Secca Ruivo, University of Évora, Portugal

Isabel Farinha, IADE, Universidade Europeia, Lisbon, Portugal

Jamie Brassett, Central Saint Martins, London, UK

João Paulo Martins, University of Lisbon, Portugal

José Ferro Camacho, IADE, Universidade Europeia, Lisbon, Portugal

José Vicente, IADE, Universidade Europeia, Lisbon, Portugal

Loredana Di Lucchio, Sapienza University of Roma, Italy
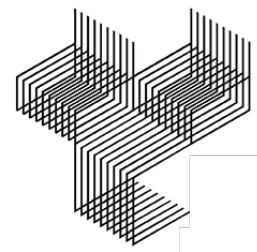
Maria Cadarso, IADE, Universidade Europeia, Lisbon, Portugal

Maria Helena Souto, IADE, Universidade Europeia, Lisbon, Portugal

Maria Walls, Media Design School, Auckland, New Zealand

Nelson Zagalo, University of Aveiro, Portugal

Paula Trigueiros, University of Minho, Guimarães, Portugal

Pedro Cortesão Monteiro, University of Lisbon, Portugal

Pedro Xavier Mendonça, School of Business Communication, Lisbon, Portugal

Pieter Desmet, Delft University of Technology, The Netherlands

Raul Cunca, Faculty of Fine Arts, University of Lisbon, Portugal

Rui Roda, IADE, Universidade Europeia, Lisbon, Portugal

Sara Gancho, IADE, Universidade Europeia, Lisbon, Portugal

Susana Gonzaga, Art and Design Department, University of Madeira, Funchal, Portugal

Susana Leonor, IADE, Universidade Europeia, Lisbon, Portugal

Teresa Chambel, Faculdade de Ciências, University of Lisbon, Portugal

Teresa Franqueira, University of Aveiro, Portugal

Teresa Sarmento, ESAD College of Art and Design, Matosinhos, Portugal

Interface Design, UX and Emotion: a State-of-the-Art Report
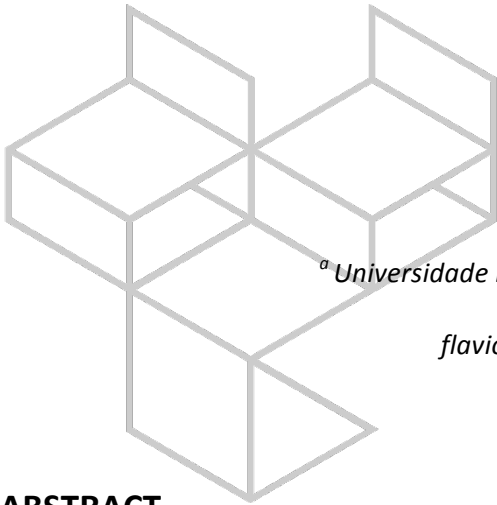
Mónica Dias [a,b]
Flávio Almeida [a,b]

[a] Universidade Europeia, IADE, Av. D. Carlos I, 4, 1200-649 Lisbon, Portugal
[b] UNIDCOM/IADE, Lisbon, Portugal
flavio.almeida@universidadeeuropeia.pt; monsdias@gmail.com

ABSTRACT

This article presents a state-of-the-art (SoTA) report of some publications by various authors about the crossing of interface design, user experience and emotion fields. The content is divided in three main parts: data collection, data analysis and data answers. Through literature review and summaries, different methodologies and theories about the subject are presented in the data collection part. Then, some of the information is intersected and compared in the data analysis part. To conclude the analysis, some questions are answered using the gathered information in the data answers part. Some of the questions answer to what is an affective interfaces, what are the emotions that users can have towards interfaces, how these emotions can be studied, among others. This review can be useful for beginners in this area to get knowledge, but also for other researchers and workers that need to consolidate or find new point of views about the theme. It can be a font of inspiration for future researches and investigations.

Keywords: Interface design, product design, user experience, emotional design, state-of-the-art.

INTRODUCTION

In the past 20 years, emotion research has been actively used in the process of producing products. The main aim of this effort was to try to predict the impact that products and services may have on user's emotions, and knowing this, try to design the product according to the most preferable emotional effect (Fokkinga, Desmet & Hoonhut, 2010, p.1).

The research already made in this area has resulted in a compilation of knowledge that can help us to understand the importance of emotion in the human-product relationship, and what methods and tools can be used to measure and design for emotion (Fokkinga et al., 2010, p.1). Although, measuring the emotional impact of the products and interfaces in users is not the same as the user satisfaction towards that same product, and should not be mistaken by the same issue (Hartson & Pyla, 2012, p.11).

When using the term interface in this paper, we are referring about graphic user interfaces (GUI). There are other types of interfaces, such as character-based interfaces (used mainly for programming), pen-based interfaces or virtual-reality based interfaces. As the name says, graphic user interfaces are based in graphics and visual elements such as windows, buttons, icons, among others (Gomes, 2016, p.5-17).

Interface design is an area inside product design. The job of an interface designer is to take care of the look and style of a product and a product designer is responsible for the whole look and feel of a product. The best products are built by people who understand the whole product. In order to make such products, interface designers should always work together with product designers, who are able to generate a process and add additional information to get the best result.

PROBLEM

When doing previous research about interfaces and guidelines, more specifically about smartphone interfaces, it was perceived that the information is much about how the interface should look and how the elements should be disposed. The presence of information about hedonic issues or what emotions can be related to the user experience of an interface is much scarcer. Given this, a question arises: By now, what have been published about the intersection of the areas of interface design, user experience and human emotions?

The purpose of this paper is to gather, resume and explore diverse literature about the theme, showing different approaches by different authors, in a state-of-art format. The final objective is to provide a better understanding and analysis of the topic to the readers, bringing reflection and new possible research problems as conclusion.

The President's Science Advisory Committee (1963, p.32) pointed out that scholarly and critical reviews and similar publications such as SoTAs can play a major role in easing the information explosion by condensing and summarizing information from various documents.

This SoTA report answer to questions such as: How users perceive emotionally the interfaces? What are the positive and negative feelings that users can have towards interfaces? What causes the negative feelings? How can these negative feelings be avoided? What is the best way to study these emotions? When is an interface considered emotional?

METHOD

The intention was to collect data written by various authors, in a number that would be suited for the extension of an article.

Among the authors selected are workers, teachers, writers and researchers from areas as design, engineering, ergonomics and philosophy. All of them work in fields related to human-computer interaction, usability, user experience, emotional behaviour, user-centred design, design thinking, and others.

The first step was to select the different books and articles about interface design and emotion. The selection criteria was aimed to present variety, innovation and exposure of different perspectives by various researchers that have connection to this subject and published valuable work. The searching for the works was made digitally, using scientific databases, such as *Research Gate*[1] and *Elsevier*[2]. Three books and two articles were chosen. The second step, represented by the "Data collection" chapter, was to read and resume the content of each work or part of it, that suits for this matter, in a way that the readers of this paper could understand the context, without reading the full document. For example, the books selected have much more content about interface design than just about emotions, given this, just the emotional part is referred. The third step was to analyse and compare the works selected, represented by the "Data analysis" chapter. The forth step was to present the conclusions of the reading in a question and answer format, represented by the chapter "Data answers".

Some of the data collected is specific, for example about websites or a product, but other authors that approach the theme in a more generalized way are also mentioned. Notice that some of the content selected is about product design and emotions and not exactly about interface design and emotions. This happens because it is difficult to find good, well ranked and trustable papers and books specifically about the theme. Also, interface can be considered a product and the information chosen can be applied to this case.

DATA COLLECTION

The data collected is displayed in the following sub chapters by authors per work, in alphabetic order. In each sub chapter is presented a very brief description of the authors and a summary of the most interesting and relevant parts of their work, for the matter of this paper.

---

[1] Online scientific publications database: www.researchgate.net

[2] Online scientific publications database: www.elsevier.com

Fokkinga, Desmet & Hoounhout

Steven Fokkinga and Pieter Desmet[3] are the authors of the article "*Ten ways to design for disgust, sadness, and other enjoyments: A Design Approach to Enrich Product Experiences with Negative Emotions*", published in the International Journal of Design in 2013.

Several papers describing how to achieve positive emotions and experiences have been published lately, but this article presented a different approach of the theme, by showing how designers can enrich user experience by purposefully include negative emotions in user-product interaction (Fokkinga, Desmet, 2013, p.19).

The method developed by Fokkinga and Desmet consists in three steps, where the designer decides which negative emotion is most appropriate for the context, how and when this emotion is best elicited and finally which protective frame is most appropriate to use and in what way it can be applied to the product concept. This protective frame theory consists in presenting representative elements to the user, causing the negative emotions but protecting them, and others around, from danger or risk situations (ibid., p. 22).

The authors present in the article ten prefabricated combinations of these steps. One of the examples of this prefabricated experiences is the case of using a mental or physical advantage to harm a person or object in a playful way. Using a detachment or safety frame, experiencing the urge of harm someone could be turned into a humorous state of mind and release that type of stress (ibid., p.23-25).

After explaining the process, the authors present the applicability of this approach with real cases, proving that designers can manipulate the user experience, combining negative emotions with protective frames to result in a rich experience (ibid., p.26-34).

Other article about this domain was published by Fokkinga, Desmet and Hoounhout, entitled "*The Dark Side of Enjoyment. Using negative emotions to design for rich user experiences*" and published in the *7th International Design & Emotion Conference* Proceedings in 2010. Once again, the authors reaffirm that negative emotions can be used to design rich experiences, using the protective frame theory. This time, an interactive session was made (Fokkinga, Desmet, Hoonhut, 2010, p.9).

One of the ideas was to use a grey mobile telephone, that was painted with several colours before the grey, so the colours were revealed with the use of the device. This concept appealed to the sentimental quality, emphasizing that the mobile telephone was getting more personal with each use, even if the object was decaying (ibid., p.9). The other idea was to use an interface in the shopping carts, that had a cartoon showing in the display, and this cartoon changed appearance according to what the user puts in the cart. The more caloric products the user putted in the cart, the fatter the cartoon looked, otherwise if the user putted healthy products in the cart, the cartoon looked slimmer and muscular. This interaction confronted the users with their choices in a playful situation (ibid., p.9-10).

This session made the authors realise that this type of changes in common products can greatly benefit neutral or boring experiences, giving the products a certain edge. Also, it was a very interesting way of changing already emotionally charged situations without block or ignoring them, making the participants think of certain issues without a negative connotation (ibid., p.10-11).

Hartson & Pyla

Rex Hartson and Pardha Pyla[4] are the authors of an extensive book (almost 1000 pages) about user experience named "*The UX book, process and guidelines for ensuring a quality user experience*", published in 2012. This sub-chapter of the paper focus on exploring what the authors state about the emotional impact as part of user experience.

Hartson and Pyla explain that the difference between two equally usable and useful design products could be an emotional spark of affinity awakened in the user. This may vary according to the experience of each user, since we all the users are different (Hartson, Pyla, 2012, p.24). The principal emotional impact factor is pleasure, but other types of feelings can be generated too, including effective qualities such as love, hate, fear or mourning (ibid., p.25). In the sub chapter 1.4.3. of the book, about aesthetics and the affects, the authors affirm that interaction design can touch the users in sensible and holistic ways. However, a recurrent issue is found during studies, which is the aesthetics is objectivity and subjectivity. The objective view means that aesthetic quality

---

[3] More information about the authors can be found at Delft Institute of Positive Design's website: http://studiolab.ide.tudelft.nl/diopd/about-us/our-team/

[4] More information about the authors can be found on *Elsevier*'s book page: www.elsevier.com/books/the-ux-book/hartson/978-0-12-385241-0.

is essential in the object or the design and is known by specific characteristics regardless of how they are perceived. This means that objective aesthetic qualities can be measured analytically. On other hand, the subjective view depends on how the object or design is perceived (ibid., p.31).

Nevertheless, it is difficult to create guidelines for measuring emotions related to aesthetics of interfaces, because the same interface can lead to different experiences depending on various factors. The typical approach is to use one-dimensional metrics such as subjective ratings or visual appeal (ibid, p.31). The authors also highlight that emotional impact is not the same as user satisfaction (ibid., p.11).

Jordan

This subsection is about the paper "*Human factors for pleasure in product use*", written by Patrick W. Jordan[5] and published in the journal "*Applied Ergonomics*" in the year 1998. Jordan also is a marketing and design consultant and have written the book "*Designing pleasurable Products*" on the area of emotional design, which is a potential future reading for this theme.

In "*Human factors for pleasure in product use*", the author starts by stating that, traditionally, the making of the products is concentrated in function and utility rather in hedonic issues. Given this, his objective in this paper was to identify the emotions related to product utilisation and find out what contributes to a product to be considered pleasurable or unpleasurable (Jordan, 1998, p.25).

To make the study, eighteen persons were selected to an interview, that took place in Glasgow. They had to answer questions about one product they loved to use, and a second product they hated to use (ibid., p.26). The most pleasurable product named by the interviewees was the stereo equipment and the least pleasurable was the alarm clock. Curiously, at this time, the computer was considered a not pleasurable product.

Since the goal was to find what feelings users can have about products, the participants didn't have a list of emotions to choose, their answers were interpreted later. For example, if a person says he "found it thrilling" it's interpreted as excitement (ibid., p.27). The results showed that security was the more related positive feeling, followed by confidence, pride, excitement, satisfaction, entertainment, freedom and nostalgia. Annoyance was the more related negative feeling, followed by anxiety, contempt, frustration, resignation, feeling cheated and finally aggression (ibid., p.27).

When asked what contributed to the pleasurable feeling when using the product, the most given answer was because the product had good features. Usability, aesthetics, good performance and reliability were also relevant dimensions. What contributed for displeasure was the poor usability of the product, poor performance, poor reliability and having an inappropriate size (ibid., p.29).

The interviewed also had to answer for how long they used the two products. Not surprisingly, a relation between the time of usage and how pleasurable was the product was found. More pleasure corresponds to more usage and less pleasure corresponds to less usage (ibid., p.29). It can be assumed that if the user doesn't like the product he will discard.

This study showed clearly that the human factor is very important in product creation and some emotions define better the relationship between the user and product than others. Security, confidence, pride, excitement, satisfaction, entertainment, freedom, nostalgia, aggression, cheat, resignation, frustration, contempt, anxiety and annoyance can be the best words to describe user's emotions towards products.

Norman & Reimann

Donald Norman is the author of the book "*Emotional Design - Why we love (or hate) everyday things*", published in the year 2004. Norman is also the director of "*Design Lab*" at the University of California, a keynote speaker and a well-known author with several books published[6].

In the 3rd chapter of "*Emotional Design - Why we love (or hate) everyday things*", the author purposes a three-level cognitive and emotional processing model, constituted by visceral design, behavioural design and reflective design:

- Visceral design is the first and the most immediate level of processing, in which we react with our sensory aspects to the product. It is about appearance and attractiveness and appeals to intuition. Responds to the question: how it looks and feels? (ibid., p. 65-69).

---

[5] More information about the author can be found on the official website: www.patrickwjordan.com.

[6] More information about the author can be found on the official website: www.jnd.org.

- Behavioural design is the middle level of processing, that lets us manage simple behaviours and emotions towards the product. It is about pleasure and effectiveness, usability and performance. Responds to the question how it works? (ibid., p.69-83).
- Reflective design is the least immediate level of processing. It is about self-image, identity, personal satisfaction and memories. Responds to the question what it means? (ibid., p.83p.89).

This process for emotional design makes the connection between how we perceive emotionally the experience and the aesthetics of a product, however, Norman doesn't suggest a direct method to integrate the model in user experience design nor interface design. That is what Robert Reimann suggests one year later with the article "*Personas, Goals, and Emotional Design",* published in *UXmatters*[7] in 2005.

Reimann is an author, UX and interaction designer, researcher at *althenahealth* and founder director of the *Interaction Design Association* in Massachusetts. Reimann (2005) relates the three-level method with Alan Cooper's (2003) goal-directed method. This method also includes three phases that can be directly compared with the Norman's model three-levels: personas, goals and scenarios.

The first phase is the creation of personas implies composing user archetypes constructed from behavioural data, with the objective of capture motivations and potential behaviours of the users (ibid.). Generating personas leads to goal creation, which is the second phase. The goal creation is divided by experience goals, end goals and life goals. The experience goals are the description of how the persona is supposed to feel about the interface, focusing in the aesthetics and interaction of the interface. The end goals are the most significant factors for evaluating the overall interface experience, describing what the persona needs to accomplish when using the interface. Life goals are about the persona's long-term desires. The goal creation leads us to the behavioural level (ibid.).

The third and last step is the creation of scenarios in order to explore the user's goals, establishing touch-points that a persona may have with the interface (ibid.)

Applying the Reimann's approach to Norman's three-level model the three phases should answer to the following questions:

- Visceral - how the user wants to feel?
- Behavioural - what the user wants to do?
- Reflective - who the user wants to be?

Also related to the matter of this paper, in the 6th chapter of the book "*Emotional Design*", Norman discusses about "*emotional machines*", where he describes how machines have already some intelligence but no emotions, stating that machines will not be smart and sensible until they have complex intelligence and an affective system (Norman, 2004, p. 161-165). Given the fact that this book was published in 2004 and many technological and design advances have been made since then, this affirmation can be questioned. Do machines need to have emotions in order to be smart and sensible or is inducing a specific emotion on the user enough? If a person can successfully pretend to feel a specific emotion to produce a certain effect on another person, why can't machines do the same? Since interface reside in the machines, the same question can apply.

Sharp, Rogers & Preece

"*Interaction design: beyond human-computer interaction*" is a book written by Helen Sharp, Yvonne Rogers and Jenny Preece[8]. The book is described as the number one reading in the Human Computer Interaction field by the publisher *Wiley*[9]. This is an extensive reading, almost 600 pages, so the main focus for this research was the 5th chapter, named "*Understanding how interfaces affect users*".

The authors start the chapter stating that the main goal of interaction design is to develop interactive systems in order to produce positive responses from users, but more recently, designers have become interested in also exploring emotional factors. Affective interfaces is the designation for this type of interface development. The objective is to motivate users to learn, play, be creative, and be social (Sharp, Rogers, Preece, 2002, p.141).

---

[7] www.uxmatters.com - *UXmatters* is a digital platform that provides articles about user experience.

[8] More information about the authors can be found on the official website: www.id-book.com/authors.php.

[9] Global publisher focused on academic publishing. Source: www.wiley.com/en-us/Interaction+Design%3A+Beyond+Human+Computer+Interaction%2C+3rd+Edition-p-9780470665763, retrieved on 9th May 2018.

An effective way to produce affective interfaces is to use expressive graphic elements to transmit emotional states, such as dynamic icons, animations, spoken messages and sounds indicating actions or events. This provides interaction feedback to users (ibid., p.143-144). The authors also mention how users have been very inventive in the way they express their feelings between each other in computer interfaces using emoticons, contributing to the affective atmosphere (ibid., p.145-147).

If a computer interface is pleasing, have beautiful graphics, good layout and well-designed fonts the users are more likely to be more tolerant when using it. Tolerance, in this case. means to give away of details of other matters rather than aesthetics, for example, waiting a little longer to load a very beautiful webpage. So, a balance between usability and aesthetics should always exist (ibid., p.143-144).

If the computer interface is not pleasing, the user tend to feel frustrated. Some of the main reasons for this emotional response happens when:

- An application doesn't work properly;
- A system doesn't do what the user wants to do;
- Expectations don't meet;
- The user doesn't know how to use an interface and can't understand it;
- The appearance of the interface is ugly;
- A system requires too many steps to perform a task (ibid., p.147-148).

In the book, the authors then present a list of some cases about this types of frustration with a description, cause, level of frustration and how to avoid them (ibid., p.148-152). The quantity of how much users will learn, buy, chat with others, and do other activities depends on how comfortable they are when using a product and how much they trust it. If the product is frustrating, probably they will stop using it (ibid., p. 163).

DATA ANALYSIS

The keyword to refer emotionally the relation between a user and the product is definitely pleasure. All of the authors mentioned at least once words related to pleasure in their texts. Since we are not studying relationships between humans, some sentiments cannot apply to the case. However, some of the authors go further and specify other words that can apply to this context.

Hartson and Pyla (2012, p.24) mention that the reason for a user to choose a product above other can be driven by emotional factors, such as pleasure, love, hate, fear or mourning. They also state that measuring the emotions generated in users by products is difficult and exist a lack of guidelines, because aesthetics can be subjective. They suggest that the most common method to analyse the emotions generated in users by products is using ratings and visual appeal. However, Jordan (1998) showed a different approach through interviewing people about their favourite and most hated product.

Also about the Hartson and Pyla (2012) reading, the book have a chapter named "*UX goals, metrics and targets*" were emotions it's a theme not included. So, the authors give us some notions about this field, but when it comes to evaluate the user experience, they don't present metrics or methods to do it.

Fokkinga and Desmet (2013) and Fokkinga, Desmet and Hoounhout (2010) studied the fact that negative emotions can be turned into positive and rich experiences using products or interfaces, through the protective frame theory, so, not only positive emotions are related with a positive user experience. Overall, these two articles were the most different from the others selected for this literature review, because it is about using products to achieve certain emotions, unlike the rest of the other texts that are more about what emotions users can have towards products. Besides of being a very interesting point of view, this research articles can provide precious guidelines for designers of how to approach sensible issues without making the user hate the product itself.

Jordan's (1998) research, about identifying emotions related to product utilisation, revealed that the feelings of the users are related to the function of the object. The alarm clock was considered the most annoying object, but this happened not because of the product itself but because of its main functionality (wake up people). In this case, the negative emotions caused by being waked up could be changed by the notion of achievement, adding the opportunity for people think about what is good for them (Fokkinga et al., 2010, p.8).

Still about the results of Jordan's (1998) research, certainly some emotions are better to describe the relationship between the user and the product than others. This study was made exactly 20 years ago, and since we live in a much more technological and machine-interactive environment, the question of if these emotions can still apply to the today's objects arised. The methodology was interesting, since the interviewed

only could pick two objects, one that they hated and one that they loved, that could maybe lead to more edgy results than if they could pick more objects to evaluate. Also, it would be interesting to know how users handle with objects that they don't like. Back to the alarm clock case, it's an object needed by many people, and even if it is replaced by other clock, it could still produce displeasure feelings.

Norman & Reimann sub chapter explore the three-level cognitive and emotional processing model by Norman (2004) and the suggestion of a direct method to integrate the model in user experience design and interface design by Reimann (2005). Summarizing the previously presented text: Norman's three-level method for emotional design consist in visceral design, behavioural design and reflective design; Visceral design appeals to the subconscious reaction based on the appearance of a product; Behavioural design appeals to the reaction that stems from the ease or difficulty of use. Reflective design appeals to the reaction that derives from self-image, experience and memories. During the research, it was found that this model is very popular and referred among the academics and other researchers of design and user experience fields.

Reimann (2005) defend that the better way to apply Norman's (2004) model to interface design is to follow the goal directed approach. This consists in creating personas in the first phase, create goals for the personas would be the second phase, and finally apply the personas to created scenarios would be the third and last phase. This suggestion seems valid and makes sense, but the method was still not tested, meaning a possible theme for future research. Notice that in this chapter the main focus was Norman's (2004) model, Reimann's (2005) approach can be considered a complement.

Sharp, Rogers and Preece (2002) mention the name *affective interfaces* to interfaces focused in emotional factors and interfaces that respond in emotional ways. When researching about this nomenclature, a company called exactly *Affective Interfaces, Inc.*[10] was found. This business have a software for evaluating the emotions of the users when using websites. This software measures joy, sadness, fear, anger, disgust and surprise. We can observe that these words are not very different from Jordan's findings in the year 1998. Yet, we can't tell how this software was made and what was the methodology used to choose these specific words. After

Rogers and Preece presented some elements that can help an interface appeal the user's emotions, but since this is a book from the year 2002, machines and interfaces are different. For example, smartphones have a much bigger touch-screen area, so more feedback of interaction is required. This could maybe be inserted in Reimann's (2005) goal-oriented approach, since these elements could make the personas closer or farther from achieving the created goals.

Even if the selected books and articles were about the same theme, the contents were very different, and this allowed to answer various questions about interface and emotions.

DATA ANSWERS

This chapter reveals the nine questions that resulted from the SoTA analysis and the correspondent answers, written in a very succinct way.

- **Q1:** What are the feelings that users can have towards products or interfaces?
  A1: Security, confidence, pride, excitement, satisfaction, entertainment, freedom, nostalgia, aggression, cheat, resignation, frustration, contempt, anxiety and annoyance (Jordan, 1998); Pleasure, love, hate, fear and mourning (Hartson, Pyla, 2012).
- **Q2:** Why users can feel negative emotions towards the products or interfaces?
  A2: An application doesn't work properly, a system doesn't do what the user wants to do, expectations don't meet, the user doesn't know how to use an interface and can't understand it, the appearance of the interface is ugly, a system requires too many steps to perform a task (Sharp et al., 2002).
- **Q3**: What happens when a product or interface causes negative emotions?
  A3: It can make the users frustrated and angry, making them not using it anymore (Sharp et al., 2002)
- **Q4** How can negative emotions be turned into positive emotions and rich experiences?
  A4: Using the protective frame approach (Fokkinga, Desmet, Hoounhout, 2010)
- **Q5**: How can user's emotions towards the products/interfaces can be studied?
  A5: With the adequate questionnaires, using ratings and visual appeals (Hartson, Pyla, 2012); With interviews (Jordan, 1998).
- **Q6:** How users perceive products/interfaces emotionally?

---

[10] www.affectiveinterfaces.com

  A6: In a three-level cognitive and emotional process, composed by a visceral dimension, behaviour dimension and a reflective dimension (Norman, 2004).

- **Q7:** How can interface designers apply the three-level cognitive and emotional processing model and create affective interfaces?
  A7: With goal directed design, creating personas, goals and scenarios (Reimann, 2005).
- **Q8:** What is an affective interface?
  A8: It's an interface created focusing on emotion factors, the objective is to motivate users to learn, play, be creative, and be social (Sharp et al., 2002).
- **Q9:** What can make an interface affective?
  A9: Graphic and interactive elements, such as icons, animations and sounds (Sharp et al., 2002).

CONSIDERATIONS

This SoTA report gives a brief example of what have been studied in the last 20 years about interface design and emotions, by condensing and summarizing data from various articles and books. Of course, much more content and theories exist, but finding trustable and recent information with easy access was difficult.

Because this work was written in a paper format, and a limit page number exists, the content presented was also limited. A longer review could be done about this theme, especially if you consider information about product design that also can be applied to interface design.

This review can be useful not only for beginners in this area to get knowledge, but also for other researchers and workers that need to consolidate or find new point of views about the theme, since the paper explores the ideas and findings of various authors. It also can be a font of inspiration to future researches and investigations.

Given this, the further investigation the suggestions are: To identify the emotions related to product utilisation and find out what contributes to a product to be considered pleasurable or unpleasurable, a remake of Jordan's (1998) research to investigate if the results are much different comparing to the late 90's; To identify what are the best research methods to study what emotions are related to product utilization (self-report, questionnaires, interviews…); To evaluate the practicably of Reimann's (2005) suggestion of the direct method to integrate Norman's (2004) model in user experience design and interface design; To Create guidelines for interface design creation and development using Norman's (2004) three-level cognitive and mental process model as a base; To make a deeper research of if machines need to have emotions in order to be smart and sensible or succeed in inducing specific emotions on the user enough?

REFERENCES

Babich, N. (2017). The Evolution of UI/UX Designers Into Product Designers. Adobe Blog. Retrieved May 14, 2018, from https://theblog.adobe.com/the-evolution-of-uiux-designers-into-product-designers/

Cooper, Alan and Robert Reimann. About Face 2.0: The Essentials of Interaction Design. Indianapolis: Wiley, 2003.

Fokkinga, S. F., & Desmet, P. M. A. (2013). Ten ways to design for disgust, sadness, and other enjoyments: A Design Approach to Enrich Product Experiences with Negative Emotions. International Journal of Design, 7(1), 19–36.

Fokkinga, S. F., Desmet, P. M. a., & Hoounhout, J. (2010). The Dark Side of Enjoyment. Using negative emotions to design for rich user experiences. 7th International Design & Emotion Conference Proceedings, 1–12.

Gomes, J. (2016). Types of Interface - IHM Interface Man Machine. UniVale.

Hartson, R., & Pyla, P. S. (2012). The UX book, process and guidelines for ensuring a quality user experience. Morgan Kaufmann (Vol. 37). USA: Elsevier.

Jordan, P. W. (1998). Human factors for pleasure in product use. Applied Ergonomics, 29(1), 25–33.

Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of web sites. International Journal of Human-Computer Studies, 60, 269–298.

Mazaheri, E., Richard, M. O., Laroche, M., & Ueltschy, L. C. (2014). The influence of culture, emotions, intangibility, and atmospheric cues on online behavior. Journal of Business Research, 67(3), 253–259.

Norman, D. A. (2004). Emotional Design - Why we love (or hate) everyday things. Basic Books.

President's Science Advisory Committee (1963). Science, Government and Information. The White House, Washington D.C.

Reimann, R. (2005). Personas, Goals and Emotional Design. Retrieved May 9, 2018, from https://www.uxmatters.com/mt/archives/2005/11/personas-goals-and-emotional-design.php

Sharp, H., Rogers, Y., & Preece, J. (2002). Interaction design: beyond human-computer interaction. Book (Vol. 11). USA: John Wiley & Sons, Inc. https://doi.org/10.1162/leon.2005.38.5.401

Kim, J., & Moon, J. Y. (1997). Designing towards emotional usability in costumer interfaces - trustworthiness of cyber-banking system interfaces. *Interacting with Computers*, (10), 1–29.