

# Emotional Design in Digital User Experience

Tanja Radovanović<sup>1</sup>, and Dijana Kovačević<sup>2</sup>

<sup>1</sup> University of Montenegro, MARDS Department, Cetinjski put b.b. Podgorica, Montenegro

<sup>2</sup> University of Donja Gorica, Faculty of International Economics, Finance and Business, Donja Gorica b.b. , Podgorica, Montenegro

**Abstract.** Design and human interaction have, in the last two decades, spread from urban environments to digital ones, as the use of digital products has become a daily norm and a necessity for most of the world's population. In the process of making a successful product design, its function, construction, usability, price, and materials were almost always considered. Still, in this paper, we are shedding light on how people perceive products through emotions and why it is so important for users and product success to include this variable into the design strategy process to get a better user experience. Considering the amount of use of digital products, there is a need to make them designed and optimized for our emotional well-being, inclusivity, and gender equality. Emotions are part of every human experience, and they are brought on by neurophysiological changes, triggered by thoughts, feelings, and behavioral responses, and are fundamental in our decision-making. The impact of emotions is an emerging research topic in every field connected to human experience, from psychology to computer science, urban planning, etc. The questions we are asking are: 'How do products elicit emotions?', 'How can designers influence these emotions?' and 'What are the patterns that can be used in the design of websites, apps, AR/VR, and metaverse spaces?' **Keywords:** emotional design, product design, design processes, user experience, well-being

## 1. Introduction (the research area, and problem definition.)

The fast-paced and ever-increasing need for new products in the field of product design resulted that in recent years the functionality and usability of the product are not enough to be competitive in the marketplace. Technology is only successful if it turns into an experience, and human tools for having experiences are emotions. Emotional design is the concept of creating designs that evoke emotions that result in positive User Experiences [1]. Emotions are proven to be fundamental for our practical rationality and decision-making, essentially all our decisions are emotional [2]. Early on designers and researchers of Human-Computer Interaction (HCI) and User Experience (UX) realized that bringing positive emotions and pleasure to the user experience can influence decision making, affect attention, memory, and engagement, and generate additional meaning for the product. It is proven that the right use of emotional design is improving the learning performance of students [3]. Product Emotional design is developed also through related models and methods, as well as cognitive theories, such as Emotional design by Don Norman [1], Affective computing [4],

Four Pleasure model by Jordan [5], Product Appraisal by Pieter Desmet [6], Kansei Engineering by Nagamachi [7], Mass personalization [8], etc. and also through Aesthetics, Colors, and Anthropomorphisms. The problem we see is that technology is advancing fast and most of these methods and models were developed at the beginning of the 2000s when we didn't have many digital products that we use daily today. As we can see the approach of even more immersive technologies, such as AR/VR and metaverse, we conclude that there is space for improvement. Technology and design have an enormous potential for promoting United Nations Sustainable Development Goals, such as well-being for everyone, reducing inequalities, and gender equality [9]. The emotion research is still an emerging field, and measuring its effect on user experience with ethical and non-invasive tools is difficult. In the past two decades, designers and researchers have been exploring the field of facilitating user's emotional states and relationships with their products, but many of them were based on tools that were based on facial recognition and artificial intelligence (AI), which are now being questioned and are a part of ethics overhaul, e.g. Microsoft limiting access to facial recognition technologies 21st of June '22. The goal of our further research will be to find patterns in user emotions and perceptions that can be turned into a UX design strategy that will be focused on describing the user's emotional state without using facial recognition and will give us further guidance on how to design for users satisfaction and well-being while using the product. We will do so through quantitative research, questionnaires, user journey maps, and the mapping of digital product-induced emotions.

## **1.1 Objectives**

This study's objective is to examine the emotional response process and its relation to design. Furthermore, we want to identify a pattern of connections between the emotional component associated with the human relationship and the user experience of digital products. And at the end of this study, it is hoped to establish a pattern recognition UX design strategy to support designers in improving designs to enhance emotional connection and human well-being.

## **2. Research background**

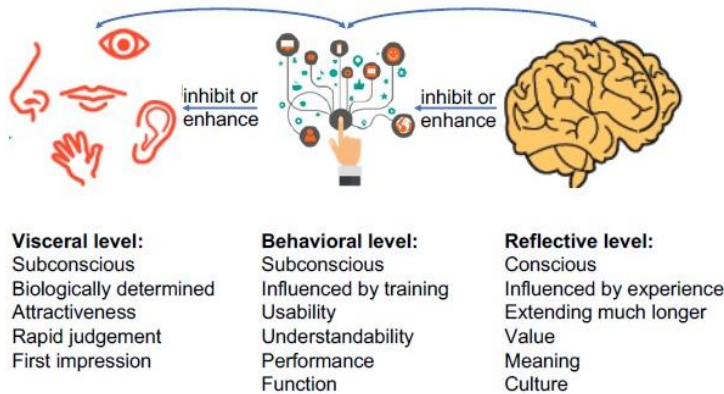
### **2.1. Three levels of Emotional design by Don Norman**

Emotional design is a concept that was first developed by Don Norman. Norman e proposed that the emotional system consists of three different, yet interconnected levels and that each of them influences our experience of the world in a particular way. They are visceral, behavioral, and reflective (see Figure 1.) [1].

The first level is Visceral design, which refers to users' perception, opinion, emotion, and decision to use it or not, formed in the first 5 seconds of approaching it. Visceral design is communicated through deeply emotional sensations such as connecting with users' values, beliefs, feelings, and how they want to be seen by other people or themselves [1].

The second level is Behavioural Design and it is connected with the pleasure of effectiveness of use or usability of the product. It focuses on how easily users can achieve their set goals while using the product, and it's the easiest one to test. Good usability will provide positive emotions, while bad will provide negative, and might make the user give up on using the product.

The third level is Reflective Design and it's a step of rationalization and intellectualization of a product. At this level, the user is asking themselves 'does this product tell a story about me? Does it match my self-image, my pride, how I wish to be perceived in society?'. Compared to Visceral, Reflective is a conscious thought level, and here the user is judging the design more rationally, and calculating the pros and cons of buying the product, after they saw it, felt it, and used it.



**Fig. 1.** Three levels of Norman's Emotional design.

All three levels are activated when a user makes a decision to buy any object or service, from a house, car, mobile phone, digital product, etc. and therefore all three are important to consider in the design process.

## 2.2. Other Models and Methods related to Emotional design

Human cognitive processes are allowing us to take in the information, process it through our own personal filters, and emotional and rational constructs, evaluate it and analyze its importance or relevance for our past, present, or future, and store it in our memory to be used for future creation of thoughts and actions. This process is deeply involved with our emotional state, as both our emotions can influence the filters to work in various different ways. Attention, sensation, perception, memory encoding/retrieval, reasoning, and cognition are key events in the human cognitive process and information processing and are all influencing how we interact with our environment and digital products, therefore they have to be taken into consideration when applying Emotional design.

Following are some of the models and methods related to Emotional design that are used and applied in design theories and practice. Supporting his theory that objects should be useful, usable, and pleasurable, Jordan proposed the method of **Four pleasures** that products should have: physiological, social, psychological, and ideological. They refer from sensory responses, including visual, auditory, tactile, and olfactory, to social recognition and accomplishment of tasks [5]. **Kansei Engineering** was developed in Japan as early as the 1970s, and it predates all the Western thinking about the connection between emotions and design. The word Kansei is defined by Nagamachi as 'the state of mind where knowledge, emotion, and passion are harmonized'. The method of Kansei has been used for decades in the design of Japan's automotive industry (especially Mazda) and it has since spread to many more industries and countries [7]. **Affective computing** is developed by Picard and it aims

to design and develop systems that recognize, interpret, respond to and simulate human emotions. Data is collected through sensors, heart rate, facial and vocal expressions, gestures, etc, and then the simulation of human emotions and behavior is designed into social robots, AI, or virtual agents [4]. Pieter Desmets's **Appraisal theory** says that if the user engages with a product (stimulus) and his attitude towards it is positive (interested) then the appealingness of the product (appraisal) may lead to emotion (joy/happiness) [6]. **Mass personalization** is a strategy for designing products and services to meet individual users' needs. Personalization techniques are based on big data and AI and are mostly done without users' being aware, if it's done too aggressively it can backfire and users might feel uncomfortable and stop using the product [8]. In Table 1. we can see the summary of the advantages and disadvantages of the currently most used models and methods in Emotional design are given in the Table 1 . We also notice that none of these models consider users' well-being.

**Table 1.** Summary of models and methods related to emotional design

Name	Process	Tools	Advantages	Disadvantages
Emotional design	Visceral, behavioral, reflective	Human-centered design methods	Strongly supported by psychology theory	Missing implementation tool and strategies
Four pleasures	Physiological, social, psychological, and ideological	User research tools	Applicable quantifiable research methods	Missing implementation tool and strategies
Kansei Engineering	Shaping Kansei into product design	Kansei Engineering systems (KES)	Widely applied in Japan with success	Japanese culture focused and difficult to apply in other countries
Affective Computing	Emotion recognition	Machine learning, AI	Precise definition of emotional states	Big data needed, privacy, and ethical issues
Appraisal theory	Process of eliciting emotions	Sources of product emotions	Describing sources of product emotion	Missing implementation tool and strategies
Mass personalization	Design for individual users' needs	Machine learning, AI	Fast connection with the users	Big data needed, privacy, and ethical issues

### **2.3. Product Emotion and Emerging Technologies**

Augmented and Virtual Reality (AR/VR) are one of the technologies with the highest projected potential for growth. Apart from Virtual and Augmented reality, there is also a combination of both realities called Extended reality. This hybrid technology makes it possible, for example, to see virtual objects in the real world and build an experience in which the physical and the digital are practically indistinguishable. Massive improvement of these technologies is paving a path to the development of Metaverse, which was for a long time just part of futurism and science fiction. Since the transition of Facebook into Meta in 2021 and their focus on the development of this immersive virtual world, where we'll be able to interact, shop, sell, build and create, it's inevitable that it's one of the future Web 3.0 technologies that will change the way we behave and interact (with the space around us, each other, and even ourselves). Right now the focus topic of Metaverse development is gaming, but the plan is to develop the technology for work productivity, interactive learning, e-commerce, real estate, fashion, etc.

As in these emerging technologies users will be immersed in virtual spaces and environments, in this section, we will talk more about how space influences our emotional state and perception. It is known that the arrangement of space influences people's opportunities to interact, socialize, move, have sufficient daylight, and fresh air, and therefore a good mood and good health, or the opposite, bad health. Finnish architect Alvaro Aalto noted, "When I enter a space, the space enters me and transforms me" [10]. Therefore, the idea that emotions are driving the design and that we are designing emotions into space is a common one, even though more in-depth research on it started only recently as AR/VR and brain scan technologies advanced and experiment results are more accurate and not self-measured. Neuroarchitecture is a connection between neuroscience and a built or virtual environment that enables us to record how we perceive and orient our bodies in space. Through this approach, we unravel why we respond in certain cognitive and emotional ways to our surroundings. For example, it is proven through neuroscience that views of nature positively affect emotional and physiological states (even speed up hospital recovery), high ceilings inspire creativity, or curved geometric spaces are preferred by our brains over angled geometric spaces [11]. However, it is still a question of how will new virtual spaces influence users, or how will virtual vegetation have the same influence. In today's AR/VR games spaces are usually quite complex, and with a lot of details, to make the space realistic, however, humans prefer moderate levels of complexity compared to high levels. It is possibly a leftover of our ancestral past, as the results of recent studies show that most preferred spaces have the biggest similarity to the African savannah environment [12]. Humans also still have the prospect of refuge, as they prefer spaces that offer visual control of the environment and offer places to hide, which is currently not a concern in virtual environment design [13]. The most common emotional states connected to space are a sense of security, comfort, happiness, and annoyance. Current built space is the largest artifact that humankind has made and is the product of spatial planning processes developed through centuries. Built and virtual architecture can trigger brain activation and modulate genetic function, therefore changes in our environment have important impacts on our mental health through both psychological and social effects.

### **3. Methodology**

Our empirical study methodology for answering research question objectives is still in development. Current intentions and involved works are:

1. To collect data based on questionnaires created to examine certain design experiences and ask international users to rate the intensity of certain emotions and well-being.
2. To follow a whole day of users through Journey maps (Figure 2) and mark the peak moments of positive or negative emotions and how they can influence users' well-being and later interaction with the product. The collected data would proceed to complete other inputs of research.
3. To gather data on the most common emotions connected to certain products, sort them into groups related to product types and map them.

Collected data would be involved in statistical quantitative software research.

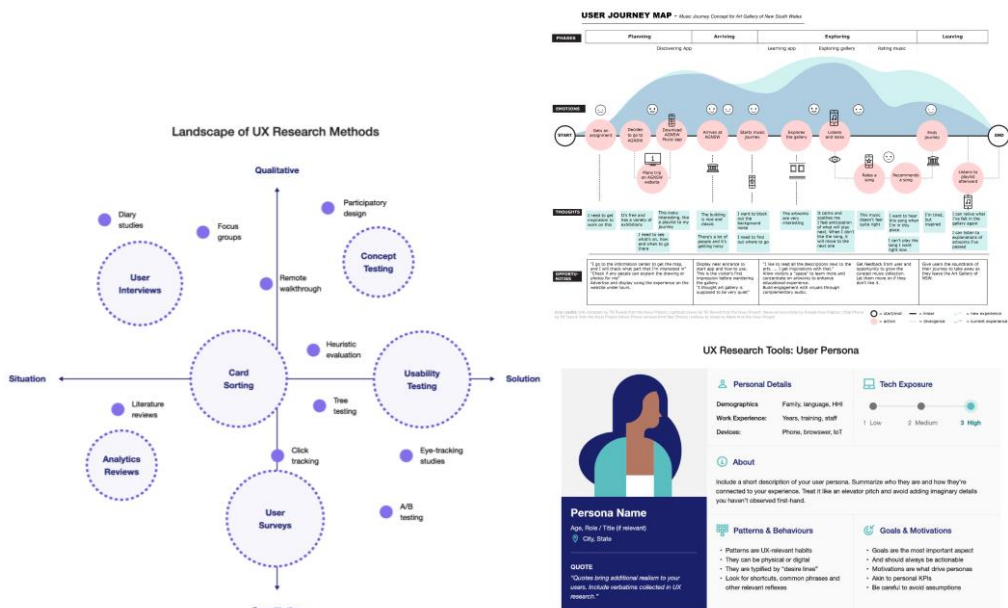


Fig. 2. Landscape of UX research methods, an example of Journey maps, and Personas

## 2.2 Further works

Our further work goals are to define the empirical study experiment and to fulfill our objectives which are: 1. to examine the emotional response process and its relation to design 2. to identify a pattern of connections between the emotional component associated with the human relationship and user experience of digital products, 3. to establish a guideline of strategies to support designers in improving designs to enhance the emotional connection and human well-being.

## 3. Conclusion

Design of digital products and human interaction with them became a daily norm, therefore, they have to be optimized for human emotional well-being and positive experience. Emotional design consideration can lead to improvement of the well-being of users, advancement in inclusivity and gender equality, and steps to fulfillment of three United

Nations Sustainable Development Goals. Evaluating various design methods, models, and cognitive theories we concluded that there is space for improvement, as technology is advancing fast, and most of these models date from the beginning of the 2000s when we still didn't have many digital products that we have now. Inclusion of users' emotions in the design process is essential but has to be done in ethical and noninvasive ways, therefore we suggest a method that will not use any facial recognition or other intrusive technologies. Emerging technologies or AR/VR and Metaverse will require more attention and research, as our shaping environment becomes more digital than physical. Empirical studies will be conducted to better describe the relation between emotional responses and design, to discover patterns of this relation, and to make guidelines for further implementation of this knowledge in the HCI and UX field.

## References

- [1] Norman, Donald A. *Emotional Design: Why We Love (or Hate) Everyday Things*. New York: Basic Books, 2003.
- [2] Jennifer S. Lerner, Ye Li, Piercarlo Valdesolo, Karim S. Kassam (2015) *Emotion and Decision Making*, *Annual Review of Psychology* 66:1, 799-823
- [3] Li, J., Luo, C., Zhang, Q. (2020). Can emotional design really evoke emotion in multimedia learning? , *International Journal of Educational Technology in Higher Education*, volume 17, 24. <https://doi.org/10.1186/s41239-020-00198-y>
- [4] Rosalind W. Picard (1995) *Affective Computing*, MIT Media Laboratory; Perceptual Computing; 20 Ames St., Cambridge, MA 02139 [picard@media.mit.edu](mailto:picard@media.mit.edu), <http://www.media.mit.edu/~picard/>
- [5] Patrick W. Jordan (1996) *Human factors for pleasure in product use*, *Applied Ergonomics* Vol 29, No1, pp 25-33
- [6] Desmet, Pieter. (2007). *Nine sources of product emotion*.
- [7] Lee, Seunghee & Harada, Akira & Stappers, Pieter Jan. (2002). *Pleasure with products: Design based on Kansei*. *Pleasure with Products: Beyond Usability*. 10.1201/9780203302279.ch16.
- [8] Zhou, Feng & Ji, Yangjian & Jiao, Roger. (2020). *Emotional Design*., To Appear in the 5th edition of the *Handbook of Human Factors and Ergonomics*
- [9] United Nations, 2022.09.07., *Sustainable Development Goals*, <https://sdgs.un.org/goals>
- [10] Eberhard John (2009), *Applying Neuroscience to Architecture*. *Neuron* 62
- [11] Higuera Trujillo, Juan Luis & Llinares, Carmen & Macagno, Eduardo. (2021). *The Cognitive-Emotional Design and Study of Architectural Space: A Scoping Review of Neuroarchitecture and Its Precursor Approaches*. *Sensors*. 21. 2193.
- [12] Joye, Y. (2007) *Architectural lessons from environmental psychology: The case of biophilic architecture*. *Rev. Gen. Psychol.*, 11, 305–328.
- [13] Dosen, A.S.; Ostwald, M.J. (2016) *Evidence for prospect-refuge theory: A meta-analysis of the findings of environmental preference research*. *City, Territ. Archit.*



**Tanja Radovanović** obtained her MSc degree from Tallinn University of Technology on the topic of Architecture Participation Design. She had educational stays in Estonia, Germany, Israel, Slovenia, Austria, Portugal, and Montenegro where she worked on various international competitions, and won first prizes. Her work is based on the connection of humans and the context of their experience, and now she's applying these principles to emotional design and user experience.