

ABSTRACT THESIS: Research starts with retracing the steps that have brought Ergonomics and Human Factors to evolve beyond the usability. It addresses issues related to the emotional relationship that can be established between the user and the product, in the User-Centered Design paradigm. Therefore, the Research reviews the literature of the Design Research for Emotional Design, collecting the main tools and methods through which the user's emotional experience is measured in relation to a design product. Emotional response is today also measured with tools and methods of Cognitive Neurosciences, therefore the Research try to get the designer closer to some of the relevant aspect of this emerging field of research, looking at the touching points between Neurosciences and Design. Recent case-studies about Neuroaesthetics, Neuromarketing, and Neurodesign will be reviewed. With the Research Questions, it's stated that the purpose of this study is to explore if Cognitive Neurosciences can represent a shift in the approaches of Emotional Design; therefore, the Research investigates if the designers can interpret emotional responses analyzed by means of Cognitive Neurosciences' tools. Finally, the study examines if it's possible to create a tool to support the design activity including data obtained from Cognitive Neurosciences. We participated in an interdisciplinary research group composed of neuroscientists, psychologists, communication experts and bioengineers to explore the Research Questions. With the desk-research and the on-field validation, we found Cognitive Neurosciences to have potentials to represent a shift in the approaches of Emotional Design. To facilitate the dialogue between these two disciplines we defined the tool and method named ALpha Matrix and Cards, with which designers can integrate their specific knowledge and skills with new tools suggested by Cognitive Neurosciences, to understand even better the user's response.

ABSTRACT TESI: La Ricerca inizia ripercorrendo i passaggi che hanno portato Ergonomia e Human Factors ad evolversi oltre l'usabilità. Affronta le problematiche relative alla relazione emotiva che può essere stabilita tra l'utente e il prodotto, nel paradigma User-Centered Design. Pertanto la ricerca rivede la letteratura della Design Research sull'Emotional Design, raccogliendo i principali strumenti e metodi attraverso i quali l'esperienza emotiva dell'utente viene misurata in relazione ad un artefatto. La risposta emotiva è oggi giorno misurata anche con strumenti e metodi delle Neuroscienze Cognitive, per cui la Ricerca mira ad avvicinare il designer agli aspetti rilevanti di questo campo emergente di ricerca, guardando ai punti in comune tra Neuroscienze e Design. Si citeranno quindi i recenti casi studio su Neuroestetica, Neuromarketing e Neurodesign. Con le Domande di Ricerca si afferma che lo scopo di questo studio è di esplorare se le Neuroscienze Cognitive possano rappresentare un avanzamento negli approcci di Emotional Design; pertanto la Ricerca indaga se i designer possono interpretare le risposte emotive analizzate attraverso gli strumenti delle Neuroscienze Cognitive; infine, lo studio esamina se è possibile creare uno strumento per supportare l'attività di design che includa dati provenienti dalle Neuroscienze Cognitive. Pertanto abbiamo partecipato a un gruppo di ricerca interdisciplinare composto da neuroscienziati, psicologi, esperti di comunicazione e bioingegneri, per esplorare le Domande di Ricerca. Con la ricerca-desk e la convalida sul campo, abbiamo trovato che le Neuroscienze Cognitive hanno potenzialità di rappresentare un avanzamento negli approcci di Emotional Design. Per facilitare il dialogo tra queste due discipline abbiamo definito lo strumento e il metodo denominato ALpha Matrix e Cards; con quest'ultimi i designer possono integrare le personali conoscenze e capacità specifiche con i nuovi strumenti proposti dalle Neuroscienze Cognitive, per comprendere sempre meglio la risposta dell'utente.



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"What I've felt, What I've known, Never shined through in what I've shown"
James Hetfield, Lars Ulrich

"We are not thinking machines that feel, we are feeling machines that think"
Antonio Damasio

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Introduction

The user's response has been the object of research since the early days of Ergonomics and Human Factors the more research evolved about the user's behaviors, the more the scientific community has tried to understand how the relationship between the user and the product is built. Nowadays the user's response has also been studied from a psychological perspective, overpassing the initials concerns related only to the physical aspects of the user-product interaction. Simultaneously research mainly in Neurosciences have deeper analyzed the process of perception and the way the humans process information gained in the external environment. What emerged is that perception is not only a cognitive process, but it involves emotions and feelings. We understand the world surrounding us, also by means of emotions, that can give a faster response than the mind. Cartesio suggested a separation of body and mind, however recent findings reveal that they are constantly linked to determine the best response in the shortest time to the external stimuli. Based on these new findings, and thanks to new tools that allow researchers to investigate the user response in its complexity with portable tools, the process of perception in reference to any stimulus can be deeper observed. The user's response has been observed mainly by means of tools of self-report, defined by psychologists. The new tools and methods of the emerging Cognitive Neurosciences are offering new potentials to measure the user's response. Is it possible to apply the tools and methods of the Cognitive Neurosciences to the User-Centered Design paradigm to better understand the user's response? Are there in the scientific literature of the Design Research contributions that can help understand the potentials of these new tools? The Research study the User-Centered Design paradigm in relation to the emerging Cognitive Neurosciences.

Logical Framework

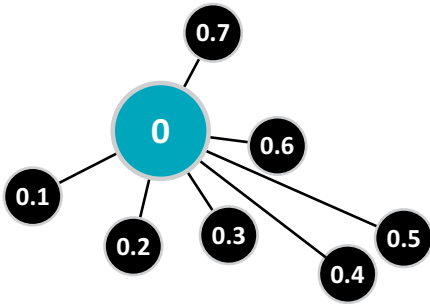
ABSTRACT

Listed are topics and macro-areas examined, defining the Research Problem, the Research Questions, the Research Objectives, Targets, showing the obtained Results and their related Phases and methods in which they were reached.

In Human-Centered Design approach (HCD), when considering all the constraints and concerns that bring to the definition of a new product, the designer considers not only shape and form, cost and efficiency, reliability and effectiveness, understandability and usability, but also the pleasure of appearance, the pride of ownership, and the joy of actual use. To investigate the user-product interaction in this broad spectrum, the design research, specifically the Emotional Design, tries to investigate on the user's affective response. The main principles and assumptions about emotions have been defined by cognitive psychology, on which related tools and methods have been developed. These tools and methods have some limits that nowadays could be surpassed with the new findings of Cognitive Neurosciences.

The research poses the following Research Questions: Q1. The purpose of this study is to explore if Cognitive Neurosciences can represent a shift in the approaches of Emotional Design. Q2. The research investigates if designers can interpret the emotional responses analyzed with the tools of Cognitive Neurosciences. Q3. The study examines if it's possible to create a tool to support the design activity which includes data deriving from Cognitive Neurosciences.

The research has been developed in an interdisciplinary research group composed of researchers in the fields of Neuroscience, Psychology, Biomedical Engineering, and Communication experts.



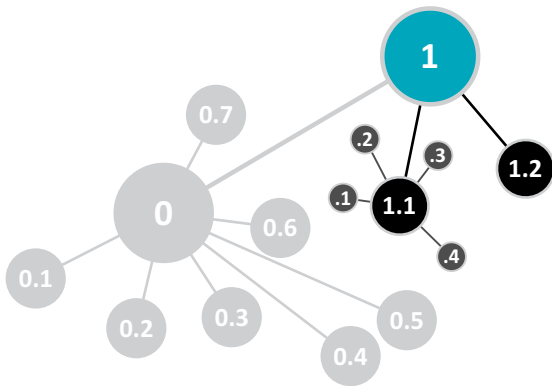
0 LOGICAL FRAMEWORK

- 0.1 Topics and Macro-Areas
- 0.2 Research Problem
- 0.2 Research Questions
- 0.4 Research Objectives
- 0.5 Research Targets
- 0.6 Results
- 0.7 Phases and Methods

CHAPTER 1 Premises

ABSTRACT

In this chapter we retrace the steps that have brought Ergonomics and Human Factors to meet, in a concept of Ergonomics that has started on the usability principle and which has evolved beyond the usability. Including not only functional requirements in design was a fundamental step towards including emotional issues among design requirements. Research fields that have met between hard sciences and social sciences have defined the concept of Pleasure in product use, trying to listen and observe the user also regarding emotional needs. Hence the definition of the Human-Centered Design (HCD) and the new challenges to which the designer is called, to make sure that the designed product leads to a user experience that is also positive and enjoyable, while the user accomplish the desired task.



1 PREMISES

1.1 Ergonomics and Human Factors

1.1.1 Usability

1.1.2 Beyond Usability

1.1.3 Pleasure

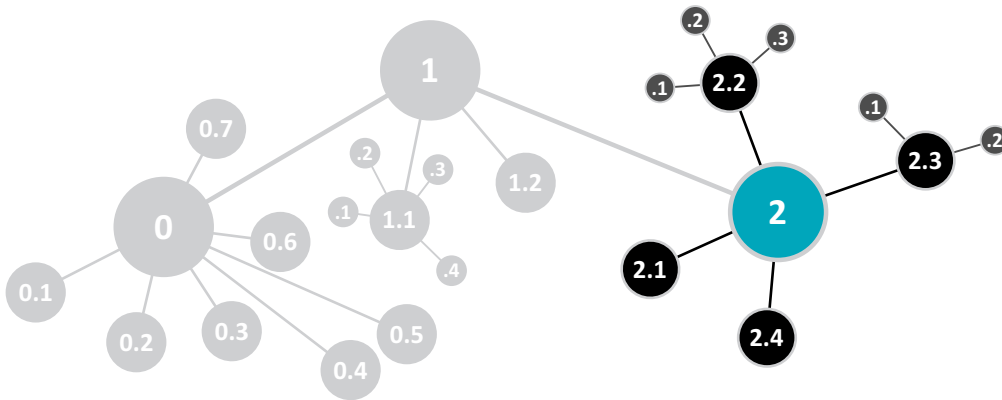
1.1.4 Pleasure in Product Use according to Jordan

1.2 Human-Centered Design

CHAPTER 2 Emotions and Perception

ABSTRACT

In this chapter, we will briefly review the literature about emotions from the cognitive perspective (see chapter Premises), selecting the findings that have led to methodologies and tools created for designers and from designers. After an overview of the different theories of emotions, the types of emotions will be differentiated, focusing again on which, among the others, have represented the premises to tools and methods for the Emotional Design approach, discussed later on. The chapter covers the issues of levels of emotional response, synesthesia, and multisensory perception, with the goal to facilitate the reading of the next chapter about Emotional Design. Finally, this chapter addresses issues related to emotional relationship that can be established between the user and the product, which are the emotions that have been identified as descriptive of the human-artifact relationship.



2 EMOTIONS AND PERCEPTION

2.1 Definitions

2.2 Types of Emotional Response

2.2.1 Basic Emotions

2.2.2 Appraisal

2.2.3 Valence - Arousal

2.3 Perception, Senses and Multisensory Integration

2.3.1 Perception

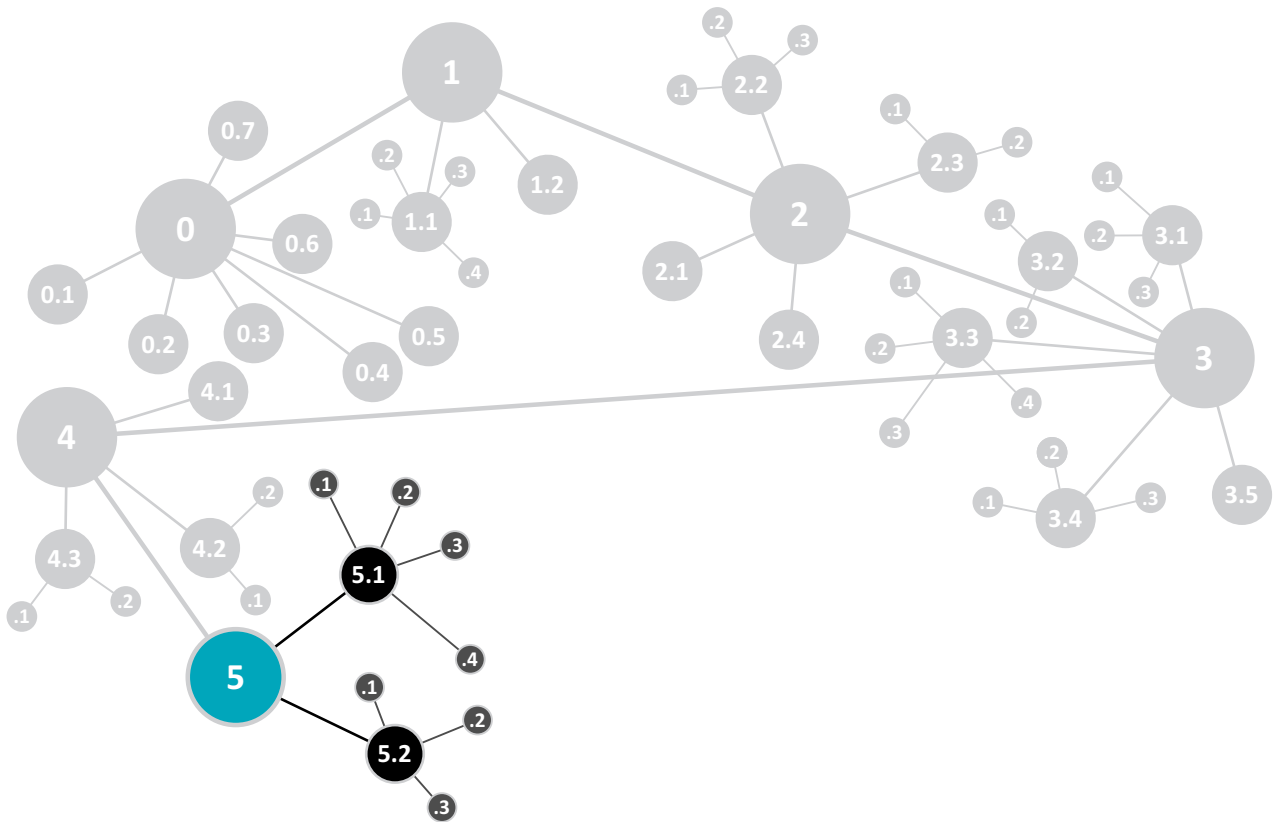
2.3.2 Synesthesia

2.4 The Effects Produced by an Artifact

CHAPTER 5 Cognitive Neurosciences

ABSTRACT

In the following chapter we frame Cognitive Neurosciences, with the aim to bring the designer closer to these disciplines and facilitate the reading of this research. To depict a more complete picture of the research fields that may constitute a potential advancement for Emotional Design, we focus on the process of perception; it's the fulcrum around which the main theories have developed and have inevitably also interested the scientific community of Design. Gibson's ecological approach, for example, was crucial for the definition of Affordances, which for some time were also at the center of the debate in the Design Research, before Norman differentiated the Affordances for the Design practice and the ones for the Psychology. To speak about the process of perception requires at least the introduction of the concepts of Sensory-motor System and of how the Cerebral cortex is structured. As defined in the Research Objectives, specifically in RO.4, one of the objectives is to integrate, if possible and useful, Emotional Design and Cognitive Neuroscience: it is therefore necessary to provide the reader, that has background in Design but without background in disciplines related to Medicine, some information allowing the reading of the entire research. This is obviously not an attempt to retrace the history of Neuroscience nor to compare the scientific literature of the discipline, for which we do not have the necessary knowledge, but it is an attempt to bring other designers closer to this emerging and potentially useful research area of Design. We will then focus on how this area of research is measuring what Design calls User Experience, so we will mention neurophysiological indices that are being adopted and which we will find in the final experiments. For these chapters distant from the discipline of Design, and therefore from our specific background, participation in the interdisciplinary research group has been crucial for the speed in retrieving information as well as for the quality of the information itself.



5 COGNITIVE NEUROSCIENCES

5.1 Research Field

- 5.1.1 Perception as a Process - Marr
- 5.1.2 Ecological Approach - Gibson
- 5.1.3 Sensory-Motor System
- 5.1.4 Cerebral Cortex

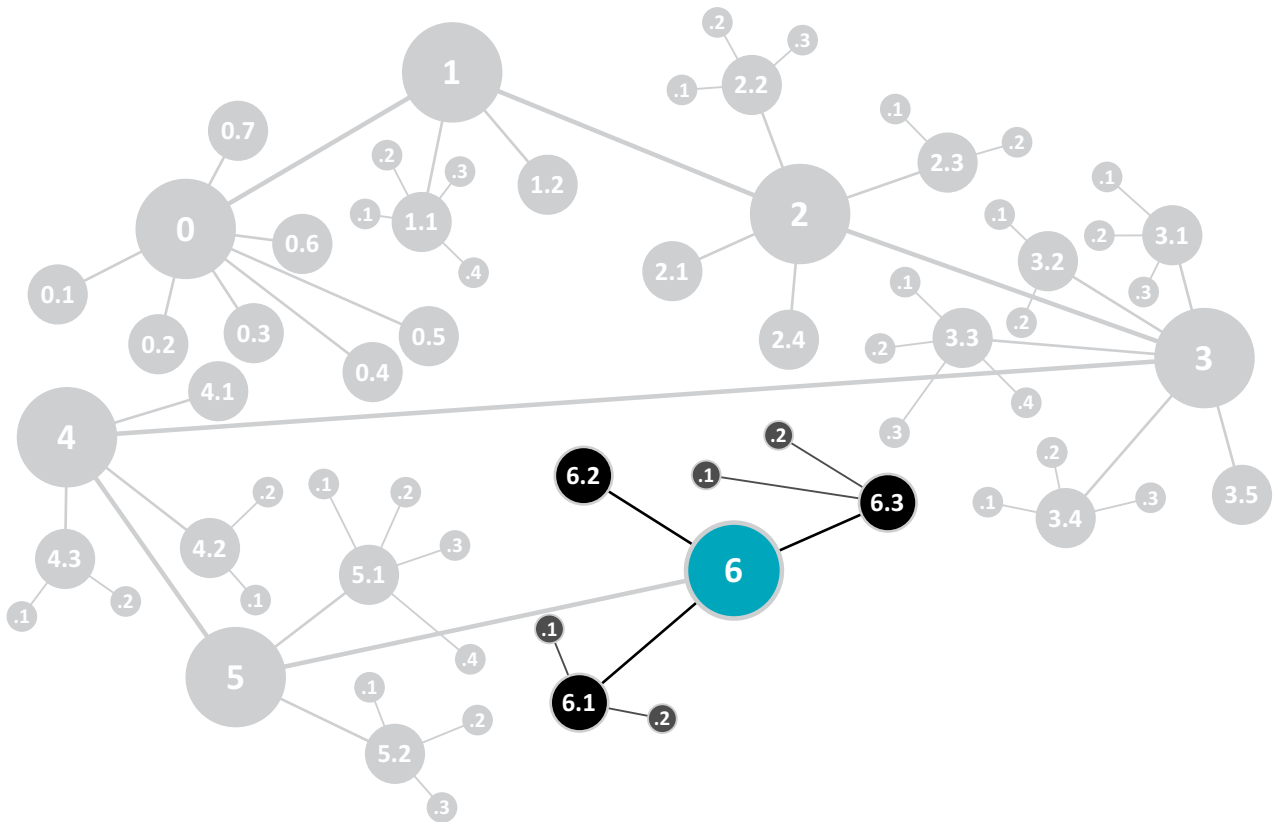
5.2 Neurophysiological Indexes

- 5.2.1 Mental Effort
- 5.2.2 Emotional Index
- 5.2.3 Interest

CHAPTER 6 Cognitive Neurosciences and Design

ABSTRACT

In this chapter, we investigate the meeting points between the Neurosciences and Design. As described in the previous chapters, assessing the process of perception and emotions has not only been at the center of the scientific debate in the discipline of Design, but also in other fields of research such as Philosophy, Art and Marketing, to name a few. Since this debate has been recently addressed by Neurosciences, we consider useful to also encompass the first attempts to understand the perception and to measure emotions elicited by visual stimuli, even if they are not directly from the discipline of Design. In reality, Neurodesign is an extremely recent field of research that is still under development. For this reason below we also retrace the early days of Neuroaesthetics, Neuromarketing, to finally describe the development of Neurodesign: an emerging branch of knowledge that is still an open debate about which potentials it has, what to expect from a neuroscientific approach to the investigation of the user, and which limitations it poses.



6 COGNITIVE NEUROSCIENCES AND DESIGN

6.1 Neuroaesthetics

6.1.1 Case Study Titian

6.1.2 Case Study Moses

6.2 Neuromarketing

6.3 Neurodesign

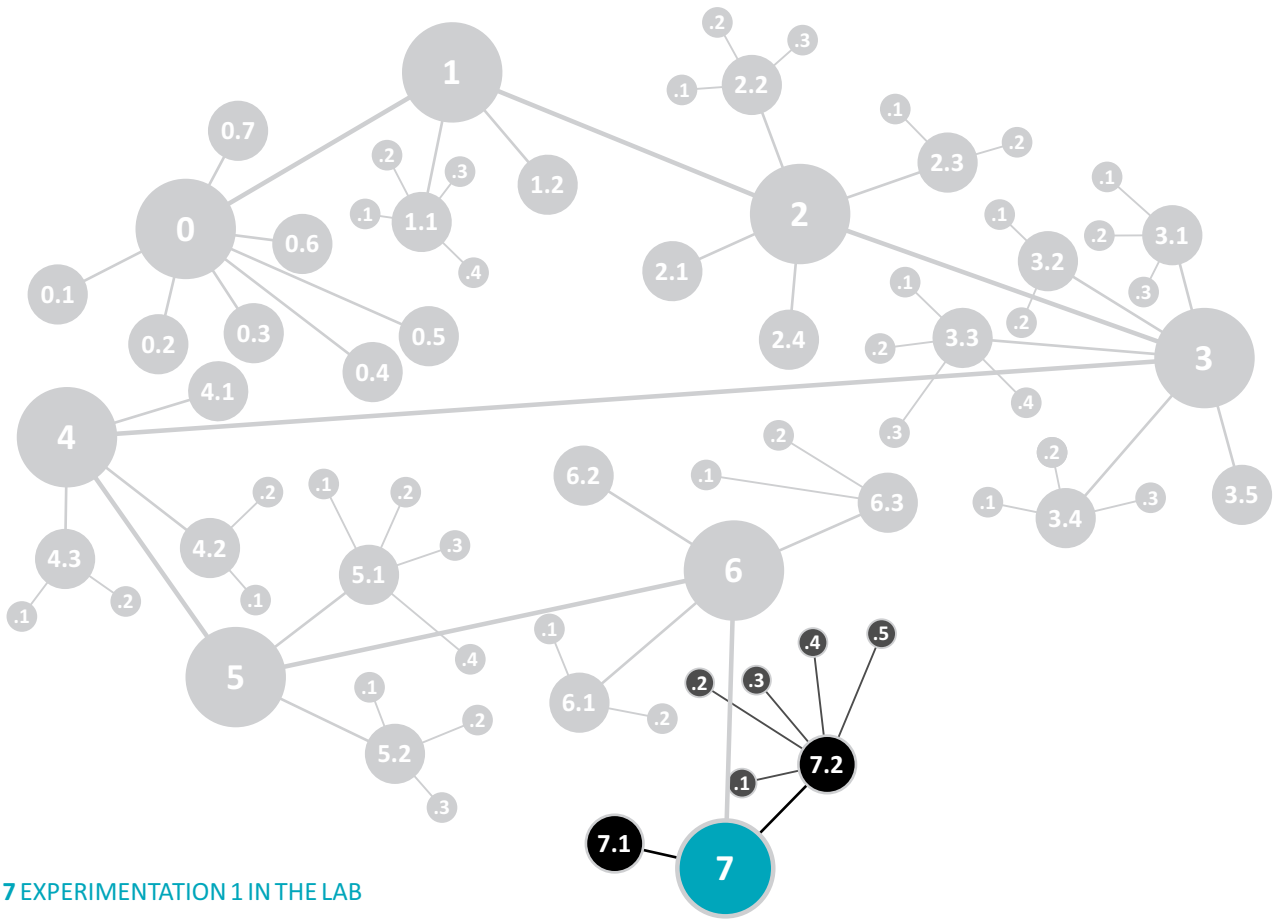
6.3.1 Case Studies Product Design's Extrinsic features

6.3.2 Case Studies Product Design's Intrinsic features

CHAPTER 7 Experimentation 1 in the Lab

ABSTRACT

In the opening chapters we described how the emotional factor is as important as the rational factor in a user-product interaction. On the emotional factor in the discipline of Design, there have been various theories and tools, as described in the chapter Emotional Design. Most of the theories originate from a Psychological approach to the evaluation of the emotional response. Today there are findings from Neurosciences, coupled with technological developments, that are allowing the measurement of emotional response with new tools promising new potentials. So far Neurosciences have been applied to measure the user response in relation to a bidimensional work of art used as a stimulus, in relation to the vision of advertising, in the vision of tridimensional work of art, although less has been done for the discipline of Design. We then participated to a multidisciplinary research-group. The group is still conducting measurements on the emotional response of users, by adopting stimuli that range from two-dimensional objects to manipulable objects. In some specific cases, we can consider a manipulable object as a product of Design. The methods to measure the neurophysiological responses, and the indexes adopted to transform these data into quantifiable values, have been described in chapter 5. We also participated in the experimentations to compare, not only from a theoretical perspective but also from an on-the-field experimentation, how Neuroscience can measure the user-product interaction, in line with the Research Questions. With the goal to compare the protocol used by the research group to the findings coming from the Design research, we also observed the experimentation of measuring the user-product interactions. It's the first step to explore the Research Questions Q1 and Q2, in which respectively we asked if Cognitive Neurosciences can represent a shift in the approaches of Emotional Design, and if the designer can interpret the emotional response data obtained with the tools and methods of Cognitive Neurosciences.



7 EXPERIMENTATION 1 IN THE LAB

7.1 Research Group - BrainSigns

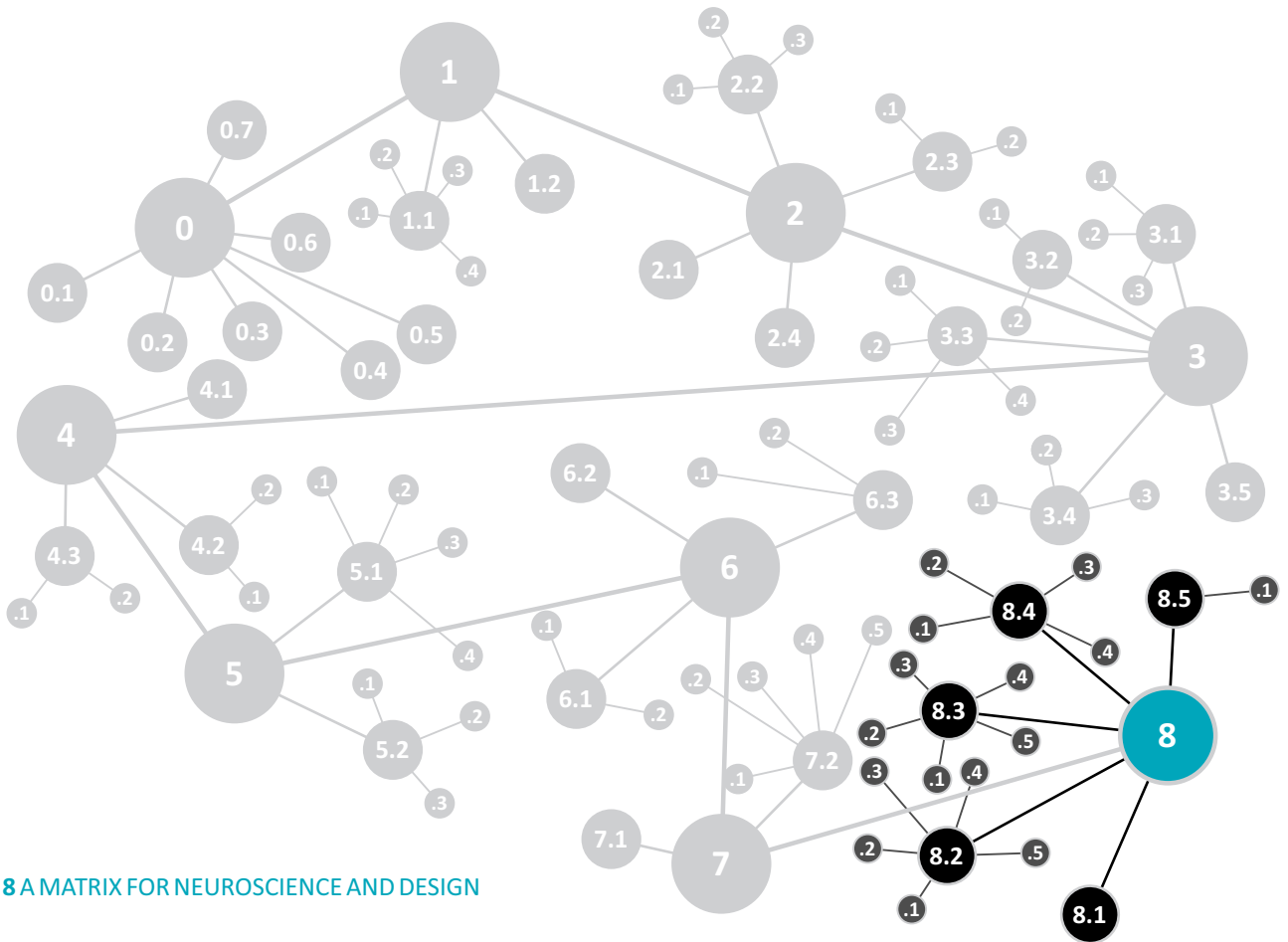
7.2 Experimentation

- 7.2.1 Participants
- 7.2.2 Instruments – Tools
- 7.2.3 Stimulus
- 7.2.4 Phases
- 7.2.5 Results

CHAPTER 8 A Matrix for Neuroscience and Design

ABSTRACT

In the previous chapter we identified, by participating in a multidisciplinary research group composed of researchers in the fields of Neuroscience, Psychology, Biomedical Engineering and Communication Experts, a certain integration of Cognitive Neurosciences' tools with the research of Emotional Design. After identifying the potentials, in this chapter we analyze how we can achieve this integration between Neuroscience and Design. We then investigated whether it is possible to use the same results and the same tools to support the designer's activity, combining the results in the field of Emotional Design research with the research of Cognitive Neuroscience. In response to this question, we have created tools and methods named, respectively, Cards and Alpha matrix. It is the second step to explore the research questions, in particular the Q3 in which we asked if it is possible to create a tool to support the design activity, which includes data obtained from Cognitive Neurosciences. The application of this tool is subsequently described in chapter 9.



8A MATRIX FOR NEUROSCIENCE AND DESIGN

8.1 Alpha Matrix

8.2 Mental Effort - Reflective Level - Instrumental Interaction

- 8.2.1 Functional Sphere
- 8.2.2 F1 Signifiers/Affordances
- 8.2.3 F2 Constraints
- 8.2.4 F3 Mappings
- 8.2.5 F4 Feedback

8.3 Emotional Index - Visceral Level - Non-Instrumental Interaction

- 8.3.1 Morphological Sphere
- 8.3.2 M1 Metaphors
- 8.3.3 M2 Relationships
- 8.3.4 M3 Typicality and Novelty
- 8.3.5 M4 Consistency of Messages

8.4 Interest - Behavioral Level - Non-Physical Interaction

- 8.4.1 Semantic Sphere
- 8.4.2 S1 Usefulness
- 8.4.3 S2 Pleasantness
- 8.4.4 S3 Rightfulness

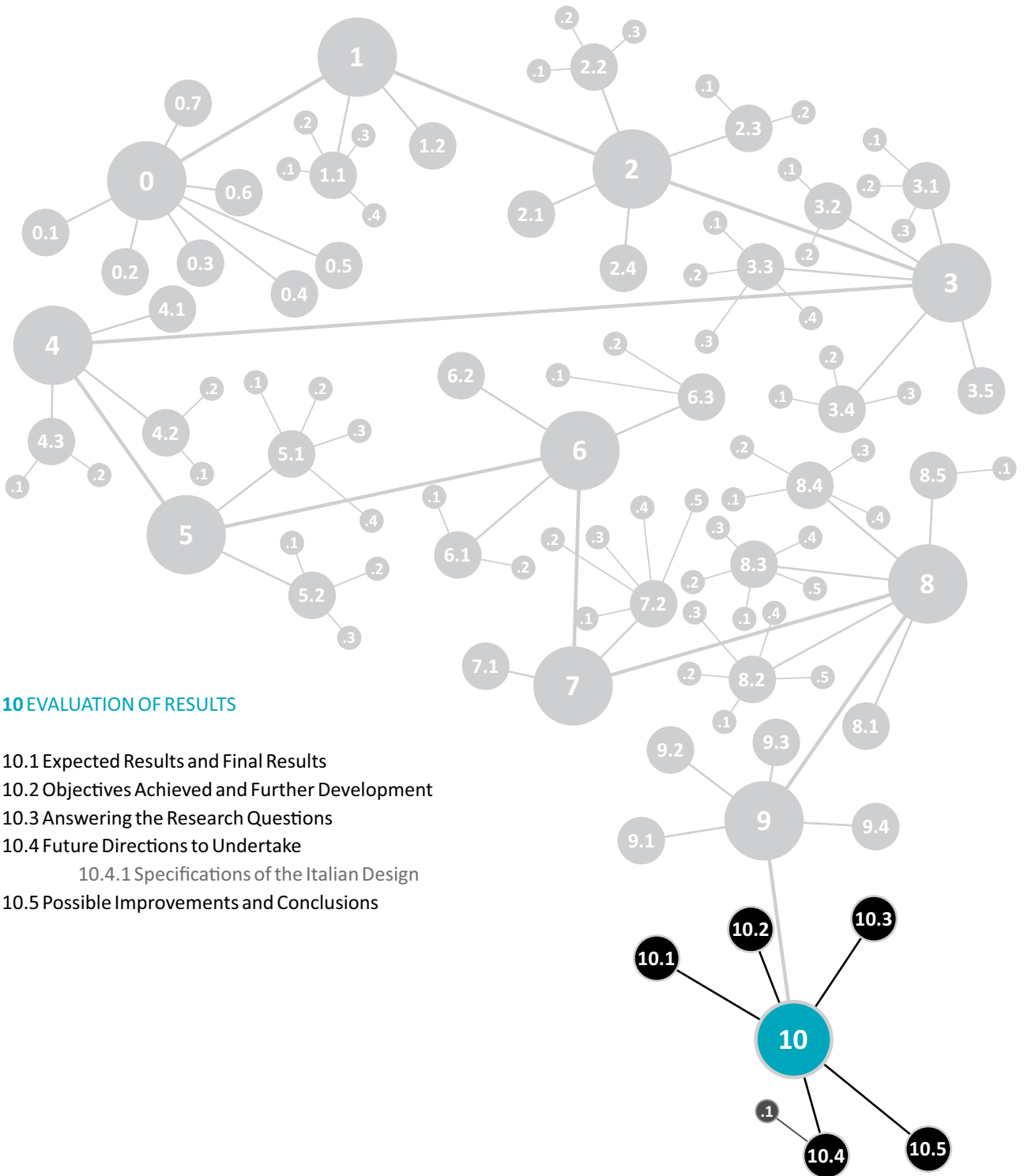
8.5 Cards

- 8.5.1 How to Use the Cards

CHAPTER 9 Experimentation 2 for Design

ABSTRACT

Based on the observation of tools and methods recently adopted by a multidisciplinary research group, focused on the measurement of the user's response to a three-dimensional stimulus that can be manipulated, we noted the potential of overlapping between Cognitive Neuroscience and Emotional Design, as highlighted in chapter 7. On the basis of these potentials, we have investigated, in chapter 8, how the scientific evidences of the two disciplines can validate this integration, defining the Alpha matrix and the operative tool Cards, to support the designer's activity. This tool, defined in chapter 8, integrates the evidence resulting from a neurophysiological measurement of the user's response with the practice of Design. In this chapter we apply that tool to the measurements of the experimentation 1 that was described in chapter 7. With this chapter, and with the application of the Alpha matrix and the Cards, we verify the operational potential of the instrument we created.



10 EVALUATION OF RESULTS

- 10.1 Expected Results and Final Results
- 10.2 Objectives Achieved and Further Development
- 10.3 Answering the Research Questions
- 10.4 Future Directions to Undertake
 - 10.4.1 Specifications of the Italian Design
- 10.5 Possible Improvements and Conclusions

References by Subject Area

Social Sciences and Psychology

- Albertazzi, L., Da Pos, O., Canal, L., Micciolo, R., Malfatti, M., & Vescovi, M. (2013). The hue of shapes. *Journal of Experimental Psychology: Human Perception and Performance*, 39(1), 37–47. <https://doi.org/10.1037/a0028816>
- Allport, G. W. (1935). Attitudes. In *A handbook of social psychology* (pp. 798–844).
- Arnheim, R. (1974). *Art and Visual Perception*. Berkeley: University of California Press.
- Arnold, M. B. (1960). *Emotion and personality*. New York: Columbia University Press. *Aubergé V* (Vol. 1). <https://doi.org/1960-35012-000>
- Bakker, I., van der Voordt, T., Vink, P., & de Boon, J. (2014). Pleasure, Arousal, Dominance: Mehrabian and Russell revisited. *Current Psychology*, 33(3), 405–421. <https://doi.org/10.1007/s12144-014-9219-4>
- Berkowitz, L., & Semin, G. R. (2004). Socially situated cognition: Cognition in its social context. *Advances in Experimental Social Psychology*, 36, 53–117.
- Beuzekom, M. Van, Caicedo, D. G. D., & Beuzekom, M. Van. (2006). How do you feel? - An assessment of existing tools for the measurement of emotions and their application in consumer product research. *Delft University of Technology, Department of Industrial Design*, 1–29.
- Blijlevens, J., Hekkert, P., Leder, H., Thurgood, C., Chen, L. L., & Whitfield, T. W. A. (2017). The aesthetic pleasure in design scale: The development of a scale to measure aesthetic pleasure for designed artifacts. *Psychology of Aesthetics, Creativity, and the Arts*, 11(1), 86–98. <https://doi.org/10.1037/aca0000098>
- Boselie, F., & Leeuwenberg, E. (1985). Birkhoff revisited: beauty as a function of effect and means. *The American Journal of Psychology*. <https://doi.org/10.2307/1422765>
- Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *I. B&W Thu. & Exp. Psvchrar*, 25(1), 49–59.
- Bregman, A. S. (1990). *Auditory Scene Analysis: The Perceptual Organization of Sound*. *Auditory Scene Analysis The Perceptual Organization of Sound*.
- Cacioppo, J. T., Berntson, G. G., Larsen, J. T., Poehlmann, K. M., & Ito, T. A. (2000). The psychophysiology of emotion. In *The handbook of emotion*. New York: Guilford Press.

- Cattarinussi, B. (2006). *Sentimenti, passioni, emozioni. Le radici del comportamento sociale*. F. Angeli.
- Cytowic, R. E. (2002). *Synesthesia : A Union of the Senses*. MIT Press.
- Damasio, A. R. (1994). Descartes' Error and the Future of Human Life. *Scientific American*, 271(4), 144–144. <https://doi.org/10.1038/scientificamerican1094-144>
- Du, S., Tao, Y., & Martinez, A. M. (2014). Compound facial expressions of emotion. *Proceedings of the National Academy of Sciences of the United States of America*, 111(15), E1454-62. <https://doi.org/10.1073/pnas.1322355111>
- Ekman, P. (1972). Universals and cultural differences in facial expressions of emotion. *Nebraska Symposium on Motivation*. <https://doi.org/10.1037/0022-3514.53.4.712>
- Ekman, P. (1993). Facial expression and emotion. *American Psychologist*. <https://doi.org/10.1037/0003-066x.48.4.384>
- Ekman, P. (2013). *Te lo leggo in faccia : riconoscere le emozioni anche quando sono nascoste*. Amrita.
- Ekman, P., & Friesen, W. V. (1978). The Facial Action Coding System. *Consulting*.
- Ekman, P., & Rosenberg, E. L. (1997). *What the face reveals: basic and applied studies of spontaneous expression using the facial action coding system (FACS)*. Oxford University Press.
- Ekman, P., Davidson, R. J., & Friesen, W. V. (1990). The Duchenne Smile: Emotional Expression and Brain Physiology II. *Journal of Personality and Social Psychology*. <https://doi.org/10.1037/0022-3514.58.2.342>
- Frijda, N. H. (1986). *The emotions. The Emotions* (Vol. 1). <https://doi.org/10.1093/0199253048.001.0001>
- Galletta, A. (2013). *Mastering the SemiStructured Interview and Beyond: From Research Design to Analysis and Publication*. New York University Press. <https://doi.org/9780814732946>
- Gaver, W. W., & Mandler, G. (1987). Play it again Sam: On Liking Music. *Cognition and Emotion*. <https://doi.org/10.1080/02699938708408051>
- Geneva Emotion Research Group. (n.d.). Geneva Emotion Wheel - Version 3.0 - Instructions. Retrieved from https://www.affective-sciences.org/index.php/download_file/view/401/605/
- Gibson, J. J. (1977). The concept of affordances. In *Perceiving, Acting, and Knowing: Toward an Ecological Psychology* (pp. 67–82).
- Gibson, J. J. (1979). *The Ecological Approach to Visual Perception*. Houghton Mifflin-Boston.
- Gibson, J. J., & Luccio, R. (1999). *Un approccio ecologico alla percezione visiva*. Bologna: Il mulino.
- Goldman, A. (2001). The Aesthetic. In *The Routledge companion to aesthetics* (pp.

- 181–192). London, UK: Routledge.
- Goldstein, E. B. (2009). *Sensation and Perception. Perception.*
- Goleman, D. (1995). Emotional intelligence. *Personality and Individual Differences*.
<https://doi.org/10.1016/j.paid.2003.12.003>
- Goleman, D. (2005). *Emotional Intelligence: 10th Anniversary Edition; Why It Can Matter More Than IQ* (Anniversar). Bantam.
- Greenbaum, P. E., Turner, C., Cook, E. W., & Melamed, B. G. (1990). Dentists' voice control: Effects on children's disruptive and affective behavior. *Health Psychology, 9*(5), 546–558.
- Grossenbacher, P. G., & Lovelace, C. T. (2001). Mechanisms of synesthesia: Cognitive and physiological constraints. *Trends in Cognitive Sciences, 5*(1), 36–41.
[https://doi.org/10.1016/S1364-6613\(00\)01571-0](https://doi.org/10.1016/S1364-6613(00)01571-0)
- Hall, M., Elliott, K., & Meng, J. (Gloria). (2017). Using the PAD (Pleasure, Arousal, and Dominance) Model to Explain Facebook Attitudes and Use Intentions. *The Journal of Social Media in Society, 6*(1), 144–169.
- Isen, A. M. (1993). Positive affect and decision making. In *Handbook of emotions* (Vol. 1, pp. 261–277).
- Isen, A. M. (2001). *An Influence of Positive Affect on Decision Making in Complex Situations: Theoretical Issues With Practical Implications.*
- Izard, C. E. (1991). *The psychology of emotions.* Plenum Press.
- Lang, P. J. (1985). The cognitive psychophysiology of emotion: Fear and anxiety. In *Anxiety and the anxiety disorders.*
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology, 22*(140), 55.
- Marr, D. (1982). *Vision. Book.*
- Martindale, C. (1990). *The clockwork muse: The predictability of artistic change.* New York, NY, USA: Basic Books (AZ).
- Maslow, A. H. (1943). Maslow's Hierarchy of Needs. *Psychological Review, 50*, 370–396.
<https://doi.org/10.1093/bjc/azi029>
- Mcgregor, D. (2006). *The Human Side of Enterprise* (Annotated). McGraw-Hill Education.
- Mehrabian, A., & Russell, J. A. (1974). *An Approach to Environmental Psychology. An approach to environmental psychology.*
- Milner, A. D., & Goodale, M. A. (1992). *Separate visual pathways for perception and action.*
- Monette, D. R., Sullivan, T. J., & DeJong, C. R. (2011). *Applied social research: a tool for the human services* (8th ed.). Brookscole.
- Ortony, A., & Clore, G. (1988). *The Cognitive Structure of Emotion.* Cambridge: Cambridge University Press. <https://doi.org/10.2307/2074241>
- Ortony, A., & Turner, T. J. (1990). What's basic about basic emotions? *Psychological Review,*

- 97(3), 315–331. <https://doi.org/10.1037/0033-295X.97.3.315>
- Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1957). The measurement of meaning. In *psychology*.
- Plutchik, R. (2001). The Nature of Emotions. *American Scientist*. Sigma Xi, The Scientific Research Honor Society. <https://doi.org/10.1511/2001.28.739>
- Posner, J., Russell, J. A., & Peterson, B. S. (2005). The circumplex model of affect: An integrative approach to affective neuroscience, cognitive development, and psychopathology. *Development and Psychopathology*, 17(3), 715–734. <https://doi.org/10.1017/S0954579405050340>
- Repp, B. H. (1997). The Aesthetic Quality of a Quantitatively Average Music Performance: Two Preliminary Experiments. *Music Perception: An Interdisciplinary Journal*, 14(4), 419–444. <https://doi.org/10.2307/40285732>
- Roberts, K. (2005). *Lovemarks: The Future Beyond Brands*. Powerhouse Books, New York, NY. <https://doi.org/10.1017/CBO9781107415324.004>
- Roseman, I. J., & Smith, C. A. (2001). Appraisal theory: Overview, assumptions, varieties, controversies. In *Appraisal Processes in Emotion: Theory, Methods, Research* (pp. 3–19). <https://doi.org/2009-07773-029>
- Rosenberg, M. J., & Hovland, C. I. (1960). Cognitive, affective, and behavioral components of attitudes. In *Attitude organization and change: An analysis of consistency among attitude components* (pp. 1–15). <https://doi.org/10.2307/3319768>
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6), 1161–1178. <https://doi.org/10.1037/h0077714>
- Russell, J. A., & Barrett, L. F. (1999). Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant. *Journal of Personality and Social Psychology*, 76(5), 805–819. <https://doi.org/10.1037/0022-3514.76.5.805>
- Salovey, P., & Mayer, J. D. (1990). Emotional Intelligence. *Imagination, Cognition and Personality*. <https://doi.org/10.2190/DUGG-P24E-52WK-6CDG>
- Scherer, K. R. (1986). Studying emotion empirically: Issues and a paradigm for research. In Cambridge University Press (Ed.), *European monographs in social psychology. Experiencing emotion: A cross-cultural study* (pp. 3–27). New York, NY, USA.
- Scherer, K. R. (2005, December 29). What are emotions? and how can they be measured? *Social Science Information*. <https://doi.org/10.1177/0539018405058216>
- Scherer, K. R., Shuman, V., Fontaine, J. R. J., & Soriano, C. (2013). The GRID meets the Wheel: Assessing emotional feeling via self-report1. In *Components of Emotional Meaning* (pp. 281–298). Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780199592746.003.0019>
- Skinner, B. F. (2009). About behaviorism (1974). In *Foundations of psychological thought: A history of psychology*.

- Smelser, N. J., & Baltes, P. B. (2001). *International Encyclopedia of the Social and Behavioral Sciences* (1st ed.). Elsevier.
- Snider, J. G., & Osgood, C. E. (1969). *Semantic differential technique : a sourcebook*. Chicago: Aldine Publishing Company.
- Solomon, M. R. (1983). The Role of Products as Social Stimuli: A Symbolic Interactionism Perspective. *Journal of Consumer Research*. <https://doi.org/10.1086/208971>
- Symons, D., Abramson, P. R., & Pinkerton, S. D. (1995). Beauty is in the adaptations of the beholder: The evolutionary psychology of human female sexual attractiveness. In *Sexual nature, sexual culture*.
- Tan, E. S. H. (2000). Emotion, art, and the humanities. In *Handbook of Emotions* (2nd ed., pp. 116–134). New York, NY, USA: The Guilford Press.
- Thorndike, E. L. (1920). Intelligence and its uses. *Harper's Magazine*, 140, 227–235.
- Tiger, L. (1992). *The pursuit of pleasure*. Boston: Wiley-Blackwell.
<https://doi.org/10.1002/ajpa.1330900417>
- Valdez, P., & Mehrabian, A. (1994). Effects of color on emotions. *Journal of Experimental Psychology: General*, 123(4), 394–409.
- Zellner, D. A., Bartoli, A. M., & Eckard, R. (1991). Influence of color on odor identification and liking ratings. *The American Journal of Psychology*.
<https://doi.org/10.2307/1422940>

Neuroscience, Neuroaesthetics, Neuromarketing, Neurodesign

- Azevedo, F. A. C., Carvalho, L. R. B., Grinberg, L. T., Farfel, J. M., Ferretti, R. E. L., Leite, R. E. P., ... Herculano-Houzel, S. (2009). Equal numbers of neuronal and nonneuronal cells make the human brain an isometrically scaled-up primate brain. *The Journal of Comparative Neurology*, 513(5), 532–541. <https://doi.org/10.1002/cne.21974>
- Babiloni, F., Cherubino, P., Graziani, I., Trettel, A., Bagordo, G. M., Cundari, C., ... Vecchiato, G. (2014). The great beauty: A neuroaesthetic study by neuroelectric imaging during the observation of the real Michelangelo's Moses sculpture. In *2014 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society* (pp. 6965–6968). IEEE. <https://doi.org/10.1109/EMBC.2014.6945230>
- Babiloni, F., Di Lucchio, L., Montanari, M., Paoletti, A., & Perrotta, D. (2019). *Neuroscienze e Product Design - in press*.
- Babiloni, F., Rossi, D., Cherubino, P., Trettel, A., Picconi, D., Maglione, A. G., ... Babiloni, F. (2015). The first impression is what matters: A neuroaesthetic study of the cerebral

- perception and appreciation of paintings by Titian. In *Proceedings of the Annual International Conference of the IEEE Engineering in Medicine and Biology Society, EMBS* (Vol. 2015–Novem, pp. 7990–7993). IEEE.
<https://doi.org/10.1109/EMBC.2015.7320246>
- Baumgartner, T., Esslen, M., & Jäncke, L. (2006). From emotion perception to emotion experience: Emotions evoked by pictures and classical music. *International Journal of Psychophysiology*, *60*(1), 34–43. <https://doi.org/10.1016/j.ijpsycho.2005.04.007>
- Borghini, G., Astolfi, L., Vecchiato, G., & Mattia, D. (2014). Measuring neurophysiological signals in aircraft pilots and car drivers for the assessment of mental workload, fatigue and drowsiness. *Neuroscience & Biobehavioral Reviews*, *44*, 58–75.
<https://doi.org/10.1016/J.NEUBIOREV.2012.10.003>
- Bridger, D. (2017). *Neuro Design: Neuromarketing Insights to Boost Engagement and Profitability*. (Lk. Page, Ed.). Kogan Page.
- Davidson, R. J. (2000). Affective style, psychopathology, and resilience: Brain mechanisms and plasticity. *American Psychologist*, *55*(11), 1196–1214.
<https://doi.org/10.1037/0003-066X.55.11.1196>
- Davidson, R. J. (2004). What does the prefrontal cortex “do” in affect: Perspectives on frontal EEG asymmetry research. *Biological Psychology*.
<https://doi.org/10.1016/j.biopsycho.2004.03.008>
- Doppelmayr, M., Finkenzeller, T., & Sauseng, P. (2008). Frontal midline theta in the pre-shot phase of rifle shooting: Differences between experts and novices. *Neuropsychologia*, *46*(5), 1463–1467. <https://doi.org/10.1016/j.neuropsychologia.2007.12.026>
- Gallace, A. (2015). Neurodesign: The new frontier of packaging and product design | Packaging Digest. Retrieved April 24, 2018, from <http://www.packagingdigest.com/packaging-design/neurodesign-the-new-frontier-of-packaging-and-product-design1510>
- Gazzaniga, M. S., Ivry, R. B., & Mangun, G. R. (2008). *Cognitive Neuroscience - The Biology of the Mind* (3rd ed.). W. W. Norton & Company.
- Hairston, D. W., Whitaker, K. W., Ries, A. J., Vettel, J. M., Bradford, C. J., Kerick, S. E., & McDowell, K. (2014). Usability of four commercially-oriented EEG systems. *Journal of Neural Engineering*, *11*(4), 046018. <https://doi.org/10.1088/1741-2560/11/4/046018>
- Kosslyn, S. M., & Andersen, R. A. (1995). *Frontiers in cognitive neuroscience*. Mit Press.
- McClure, S. M., Li, J., Tomlin, D., Cypert, K. S., Montague, L. M., & Montague, P. R. (2004). Neural correlates of behavioral preference for culturally familiar drinks. *Neuron*, *44*(2), 379–387. <https://doi.org/10.1016/j.neuron.2004.09.019>
- McDaniel, C., & Baker, R. C. (1977). Convenience Food Packaging and the Perception of Product Quality. *Journal of Marketing*, *41*(4), 57. <https://doi.org/10.2307/1250234>

- Modica, E., Rossi, D., Cherubino, P., Trettel, A., Picconi, D., Maglione, A. G., ... Babiloni, F. (2016). Cerebral perception and appreciation of real paintings and sculptures by neuroelectric imaging. *International Journal of Bioelectromagnetism Wwww.Ijbem.Org*, 18(2), 46–52.
- Modica, E., Rossi, D., Maglione, A. G., Venuti, I., Brizi, A., Babiloni, F., & Cartocci, G. (2017). Neuroelectrical indices evaluation during antismoking public service announcements on a young population. In *RTSI 2017 - IEEE 3rd International Forum on Research and Technologies for Society and Industry, Conference Proceedings*.
<https://doi.org/10.1109/RTSI.2017.8065949>
- Morin, C. (2011). Neuromarketing: The New Science of Consumer Behavior. *Society*, 48(2), 131–135. <https://doi.org/10.1007/s12115-010-9408-1>
- O'Regan, J. K., & Noë, A. (2001). A sensorimotor account of vision and visual consciousness. *Behavioral and Brain Sciences*, 24(05), 939–973.
<https://doi.org/10.1017/S0140525X01000115>
- Penfield, W., & Rasmussen, T. (1950). *The Cerebral Cortex of Man. A Clinical Study of Localization of Function*. Academic Medicine. Oxford, England: Macmillan.
<https://doi.org/10.1097/00001888-195009000-00037>
- Ramachandran, V. S. (2011). *The tell-tale brain: a neuroscientist's quest for what makes us human*. W.W. Norton.
- Ramachandran, V. S., & Hirstein, W. (1999). The Science of Art: A Neurological Theory of Aesthetic Experience. *Journal of Consciousness Studies*, 6(6/7), 15–51.
<https://doi.org/10.1179/174327908X392906>
- Taylor, R. P., Spehar, B., Van Donkelaar, P., & Hagerhall, C. M. (2011). Perceptual and Physiological Responses to Jackson Pollock's Fractals. *Frontiers in Human Neuroscience*, 5, 60. <https://doi.org/10.3389/fnhum.2011.00060>
- Vecchiato, G., Cherubino, P., Maglione, A. G., Ezquierro, M. T. H., Marinozzi, F., Bini, F., ... Babiloni, F. (2014). How to Measure Cerebral Correlates of Emotions in Marketing Relevant Tasks. *Cognitive Computation*, 6(4), 856–871.
<https://doi.org/10.1007/s12559-014-9304-x>
- Yoshida, T. (2002). An evaluation-model for 'KAITEKISEI' by using frequency-rhythm of EEGs. *Japanese Psychological Review*, 45(1), 38–56.
- Zeki, S. (1999). *Inner vision : an exploration of art and the brain*. Oxford University Press.
- Zeki, S., & Lamb, M. (1994). The neurology of kinetic art. *Brain : A Journal of Neurology*, 117 (Pt 3, 607–36).

Human Factors and Ergonomics

- Babbar, S., Behara, R., & White, E. (2002). Mapping product usability. *International Journal of Operations & Production Management*, 22(10), 1071–1089.
<https://doi.org/10.1108/01443570210446315>
- Gielo-Perczak, K. (2014). Multi-Method Systems Modeling and Analysis: Is It Possible to Apply Holistic Design, Linking the Physical and Cognitive Aspects? In Proceedings of the 5th International Conference on Applied Human Factors and Ergonomics AHFE 2014 (pp. 4654–4660).
- Gielo-Perczak, K., & Karwowski, W. (2003). Ecological models of human performance based on affordance, emotion and intuition. *Ergonomics*, 46, 310–326.
<https://doi.org/10.1080/0014013021000035433>
- Green, W. S. (William S. ., & Jordan, P. W. (1999). *Human factors in product design : current practice and future trends*. Taylor and Francis.
- Green, W. S., & Jordan, P. W. (2002). *Pleasure with products: Beyond usability*. (CRC Press, Ed.) (1st ed.). London: Taylor and Francis.
- ISO. (9241). *Ergonomics of human-system interaction — Part 11: Usability: Definitions and concepts. ISO 9241*.
- Jordan, P. W. (1996). Displeasure and how to avoid it. *Contemporary Ergonomics*, 56–61.
- Jordan, P. W. (1997). The four pleasures - Taking human factors beyond usability. In *From Experience to Innovation*. Tampere: Finnish Institute of Occupational Health.
- Jordan, P. W. (1998). Human factors for pleasure in product use. *Applied Ergonomics*, 29(1), 25–33. [https://doi.org/10.1016/S0003-6870\(97\)00022-7](https://doi.org/10.1016/S0003-6870(97)00022-7)
- Jordan, P. W. (1999). Pleasure with Products: Human Factors for Body, Mind and Soul. In *Product Design: Current Practice and Future Trends*. London: Taylor and Francis.
- Jordan, P. W. (2005). Designing Pleasurable Products: an introduction to the new human factors. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*. <https://doi.org/citeulike-article-id:381870>
- Jordan, P. W., Thomas, B., Weerdmeester, B., & McClelland, I. (1996). Usability Evaluation In Industry. In *Usability evaluation in industry* (pp. 189–194).
- Karwowski, W. (2005). Ergonomics and human factors: The paradigms for science, engineering, design, technology and management of human-compatible systems. *Ergonomics*, 48(5), 436–463. <https://doi.org/10.1080/00140130400029167>
- Murrell, K. F. H. (1969). *Ergonomics: man in his working environment*. (Chapman and Hall, Ed.).
- Nielsen, J., & Levy, J. (1994). Measuring usability: preference vs. performance. *Communications of the ACM*, 37(4), 66–75. <https://doi.org/10.1145/175276.175282>

- Pheasant, S., & Alston, R. (1987). *Bodyspace. International Journal of Nursing Studies* (Vol. 24). [https://doi.org/10.1016/0020-7489\(87\)90031-9](https://doi.org/10.1016/0020-7489(87)90031-9)
- Salvendy, G. (1997). Handbook of human factors and ergonomics. *Handbook of Human Factors and Ergonomics*, 9(3), 2138. <https://doi.org/10.1002/9781444395150.ch13>
- Singleton, W. T. (2010). *The Body at Work: Biological Ergonomics* (Reissue ed). Cambridge University Press.
- Wilson, J. R. (2000). Fundamentals of ergonomics in theory and practice. *Applied Ergonomics*, 31(6), 557–567. [https://doi.org/10.1016/S0003-6870\(00\)00034-X](https://doi.org/10.1016/S0003-6870(00)00034-X)

Design

- Babiloni, F., Di Lucchio, L., Montanari, M., Paoletti, A., & Perrotta, D. (2019). *Neuroscienze e Product Design - in press*.
- Biondi, E., Rognoli, V., & Levi, M. (2009). *Le neuroscienze per il design : la dimensione emotiva del progetto*. Franco Angeli
- Cila, N., Hekkert, P., & Visch, V. (2014). Source Selection in Product Metaphor Generation: The Effects of Salience and Relatedness. *International Journal of Design*, 8(1), 15–28.
- Crilly, N., Moultrie, J., & Clarkson, P. J. (2009). Shaping things: intended consumer response and the other determinants of product form. *Design Studies*, 30(3), 224–254. <https://doi.org/10.1016/j.destud.2008.08.001>
- De Fusco, R. (1985). *Storia del design* (3rd ed.). Laterza.
- Desmet, P. (2002). *Designing Emotions*. Technische Universiteit Delft.
- Desmet, P. (2003). Measuring Emotion: Development and Application of an Instrument to Measure Emotional Responses to Products (pp. 111–123). Springer, Dordrecht. https://doi.org/10.1007/1-4020-2967-5_12
- Desmet, P. (2003a). A Multilayered Model of Product Emotions. *The Design Journal*, 6(2), 4–13. <https://doi.org/10.2752/146069203789355480>
- Desmet, P. (2005). Funology. In *Funology: from usability to enjoyment* (Vol. 3, pp. 111–123). <https://doi.org/10.1007/1-4020-2967-5>
- Desmet, P. (2008). Product emotion. In *Product experience* (pp. 379–398). San Diego, CA: Elsevier.
- Desmet, P. (2010). Three levels of product emotion. In *Proceedings of Kansei Engineering and Emotion Research International Conference* (pp. 1–8). PARIS.
- Desmet, P., & Hekkert, P. (2002). The Basis of Product Emotions. In *Pleasure with Products, beyond usability* (pp. 58–66). <https://doi.org/10.1136/bmj.1.5378.253>

- Typicality and novelty as joint predictors of aesthetic preference in industrial design. *British Journal of Psychology*, 94(1), 111–124.
<https://doi.org/10.1348/000712603762842147>
- Hsu, S. H., Chuang, M. C., & Chang, C. C. (2000). A semantic differential study of designers' and users' product form perception. *International Journal of Industrial Ergonomics*.
[https://doi.org/10.1016/S0169-8141\(99\)00026-8](https://doi.org/10.1016/S0169-8141(99)00026-8)
- Hua, M., & Fei, Q. (2009). The value of unconscious behavior on interaction design. In *Proceeding 2009 IEEE 10th International Conference on Computer-Aided Industrial Design and Conceptual Design: E-Business, Creative Design, Manufacturing - CAID and CD'2009*. <https://doi.org/10.1109/CAIDCD.2009.5375279>
- Kamil, M. J. M., & Abidin, S. Z. (2013). Unconscious Human Behavior at Visceral Level of Emotional Design. *Procedia - Social and Behavioral Sciences*, 105, 149–161.
<https://doi.org/10.1016/J.SBSPRO.2013.11.016>
- Lee, S., Harada, A., & Stappers, P. J. (2002). Pleasure with Products: Design based on Kansei. In *Pleasure with Products: Beyond the Usability*. Taylor and Francis.
- Lévy, P. (2013). Beyond Kansei engineering: The emancipation of Kansei design. *International Journal of Design*, 7(2), 83–94.
- Munari, B. (1981). *Da cosa nasce cosa: appunti per una metodologia progettuale*. Laterza.
- Nagamachi, M. (1995). Kansei Engineering : A new ergonomic consumer-oriented technology for product development. *International Journal of Industrial Ergonomic*, 15, 3–11.
- Nagamachi, M. (2008). Perspectives and the new trend of Kansei /affective engineering. *The TQM Journal*, 20(4), 290–298. <https://doi.org/10.1108/17542730810881285>
- Nagamachi, M. (2010). *Kansei/Affective Engineering*. CRC Press.
- Nagamachi, M., & Anitawati, L. (2011). *Innovations of Kansei Engineering*. CRC Press.
- Norman, D. A. (1999). Affordance, conventions, and design. *Interactions*, 6(3), 38–43.
<https://doi.org/10.1145/301153.301168>
- Norman, D. A. (2002). Emotion and Design: attractive things work better. *Interactions*, 9(4), 36–42. <https://doi.org/10.1145/543434.543435>
- Norman, D. A. (2004). *Emotional Design - Why we love (or hate) everyday things*. Basic Books. https://doi.org/10.1111/j.1537-4726.2004.133_10.x
- Norman, D. A. (2004). Emotional design. *Ubiquity*, 2004(January), 1–1.
<https://doi.org/10.1145/985600.966013>
- Norman, D. A. (2004a). Attractive Things Work Better. *Emotional Design: Why We Love (or Hate) Everyday Things*, 5–7. <https://doi.org/10.1119/1.880031>
- Norman, D. A. (2004b). Emotional design. *Ubiquity*, 2004(January), 1–1.
<https://doi.org/10.1145/985600.966013>
- Norman, D. A. (2004c). *Emotional Design - Why we love (or hate) everyday things*. Basic

- Books.* https://doi.org/10.1111/j.1537-4726.2004.133_10.x
- Norman, D. A. (2013). *The design of everyday things*. New York, NY, USA: Basic Books (AZ).
- Norman, D. A. (2015). Designing Emotions: Pieter Desmet. *THE DESIGN JOURNAL*, 6(2), 60–62.
- Overbeeke, K. C. J., & Wensveen, S. S. A. G. (2003). From perception to experience, from affordances to irresistibles. In *Proceedings of the 2003 international conference on Designing pleasurable products and interfaces - DPPI '03* (p. 92). <https://doi.org/10.1145/782896.782919>
- Sener, B., & Wormald, P. (2008). User evaluation of HCI concepts for defining product form. *Design Studies*, 29(1), 12–29. <https://doi.org/10.1016/j.destud.2007.06.003>
- Shimizu, Y., Sadoyama, T., Kamijo, M., Hosoya, S., Hashimoto, M., Otani, T., ... Inui, S. (2004). On demand production system of apparel on the basis of Kansei engineering. *International Journal of Clothing Science and Technology*, 16(1/2), 32–42. <https://doi.org/10.1108/09556220410520333>
- Tomico, O., Mizutani, N., Lévy, P., Takahiro, Y., Cho, Y., & Yamanaka, T. (2008). Kansei physiological measurements and constructivist psychological explorations for approaching user subjective experience during and after product usage. In *Proceedings of the 10th International Design Conference 2008* (pp. 529–536). Dubrovnik, Croatia: University of Zagreb.
- Zhang, J., Lei, S., Harada, A., & Yamanaka, T. (2006). Driver's comfortableness and vehicle's characteristics in linear movement. *KANSEI Engineering International*, 6(2), 51–60. https://doi.org/10.5057/kei.6.2_51

Marketing and Market researches

- Bemis Company, I. (2015). *Going the extra aisle*.
- Bernstein, D. (1984). *Company image and reality : a critique of corporate communications*. Eastbourne East Sussex: Holt, Rinehart and Winston.
- Gobé, M. (2010). *Emotional Branding : the New Paradigm for Connecting Brands to People*. Skyhorse Publishing, Inc.
- Grand View Research, I. (n.d.). *Spout Pouch Market Analysis By Product Type (Beverages, Syrups, Cleaning Solution, Oils, Baby Food), By Material Used (Plastic, Aluminum Foil, Kraft Paper, The Combination Of The Materials), End Use Application (Food And Beverages, Automotive), 2014 To 2025*.
- Hammond, J. (2011). *Branding your business: Promote your business, attract customers*,

- build your brand through the power of emotion*. Kogan Page.
- Hsieh, J.-K., Hsieh, Y.-C., Chiu, H.-C., & Yang, Y.-R. (2014). Customer Response to Web Site Atmospherics: Task-relevant Cues, Situational Involvement and PAD. *Journal of Interactive Marketing*, 28(3), 225–236. <https://doi.org/10.1016/j.intmar.2014.03.001>
- Kotler, P., & Keller, K. L. (2012). *Marketing management. Marketing Management, 14th Edition*. <https://doi.org/10.1108/ssmt.2001.21913cab.040>
- Martineau, P. (1958). Sharper focus for the corporate image. *Harvard Business Review*.
- Perloff, R. M. (2017). *The dynamics of persuasion: Communication and attitudes in the 21st century. The Dynamics of Persuasion: Communication and Attitudes in the Twenty-First Century*. LAWRENCE ERLBAUM ASSOCIATES, PUBLISHERS. <https://doi.org/10.4324/9781315657714>
- Pilditch, J. (1970). *Communication by design; a study in corporate identity*. McGraw-Hill.
- Stone, M., & Woodcock, N. (1995). *Relationship Marketing (Marketing in Action)*. Kogan Page.
- Technavio. (2016). *Global Spout Pouch Market 2016-2020*.
- Transparency Market Research. (2018). *Spout Pouch Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2018 - 2026*.
- Turley, L. W., & Milliman, R. E. (2000). Atmospheric Effects on Shopping Behavior: A Review of the Experimental Evidence, 49, 193–211.
- Yani-de-Soriano, M. M., & Foxall, G. R. (2006). The emotional power of place: The fall and rise of dominance in retail research. *Journal of Retailing and Consumer Services*, 13(6), 403–416. <https://doi.org/10.1016/j.jretconser.2006.02.007>

