

# Emotional activity in early immersive design: Sketches and moodboards in virtual reality



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*In between industrial design, virtual reality and experience psychology we aim to offer engaging and efficient immersive tools to augment the design workflow. To evaluate the efficiency of our innovative design tools and their impact on the traditional industrial design process, we use experimental protocols inspired from design science, user experience evaluation and psycho-physiology. This research framework gives access to complex micro processes appearing between the designer and his tools, regarding the emotional engagement of a designer in his activity. The goal of this paper is to present how specific early design needs can be fulfilled by immersive technologies. The presented findings show the level to which an immersive experience is valid for early design tasks.*

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This paper aims to bridge the gaps between computer aided design, virtual reality, inspiration and shape creation in industrial design. It presents the development and study of a radical and innovative immersive design workflow aimed at maximizing the designers control over the design of product experience. Computer aided design software is based on a mathematical specification of shape. Humans however perceive and understand shape as an assembly and progressive deformation of primitive shapes (Leyton, 2001). The existing gap between these two approaches to shape spawns difficulties in defining human computer interaction for creative computer aided design software (Cani, 2015). The lack of knowledge concerning the shaping features of these pieces of software can initiate a time consuming trial-error process. Computer aided design tools are also scarcely used in the up-front phases of design. These expert oriented computer aided design tools have preserved traditions in human computer interfaces approach unfit to answer the need for responsiveness in early industrial design, hence engendering the expression ‘Pencil before Pixel’ (Baskinger, 2008). Virtual reality has for a long time been considered as expansive, complex and un-intuitive (Pei, 2009) and it was once measured as the least used tool in industrial design (Engelbrektsson & Södermana, 2004). Progress in technology and human computer interface has design has elevated virtual

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reality accessible both in price and complexity (Sener & Wormald, 2008). Virtual reality development methods now enable precise experiences. We aim to present an immersive approach to early design.

To do so, this article first explains the theoretical background of our work. This three part section presents what phases of design we focus on, general trends in the design activity and the role and nature of representation used by designers. This paper then present the problematic aimed at understanding if virtual reality can assist the designer in his early inspirational and generational tasks. This section is followed by the presentation of the hypothesis addressed by this research and the detailed experimental protocol set up to test this hypothesis. The final sections present the results and how they contribute to enrich the understanding of the design activity.

## *1 Theoretical background*

To outline our paper our three part theoretical background approaches the early design process, its evolution and broad types as well as the representations used during the design process. These parts settle the basic knowledge necessary for the understanding and interpretation of our study.

### *1.1 Framing the early design phases*

To refer to specific milestones in the product development process we have chosen to synthesize different models into a single one.

From a product point of view, the industrial design process can be modeled into three phases: inspiration, generation, and embodiment (Bouchard, 1997; Bouchard, Aoussat, & Duchamp, 2006). The inspiration phase (cf. Figure 1 – Phase 1) includes both an intentional exploration process in answer to the brief, and a more or less conscious memorization process of inspiration sources that goes beyond the boundaries of the professional context. A well designed product has been thought of and carefully studied to correctly fit the market. In order to do so, the designer must gather information from his environment to inspire his creative act and match a given lifestyle, ambiance, atmosphere (Caron, 2005). This data gathering is also named the exploration phase (Bonnardel & Marmèche, 2004). This phase converges towards choices defining the first guidelines. These guidelines can be formalized into moodboards representing the different takes on the product style (Setchi & Bouchard, 2010). The moodboard is used as inspirational material for the next phase. This inspiration phase is followed by the generation phase (cf. Figure 1 – Phase 2) in which the designers constructs formal representations of the product. Traditionally the first tool used to bring concepts from the imaginary to the tangible, is the pen–paper couple. The embodiment phase majorly consists in the selection of the best concept, its refinement and its production. We have chosen to focus our

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