Mood Boards as a Universal Tool for Investigating Emotional Experience

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Abstract. Emotion is an essential part of user experience. While researchers are striving for new research tools for evaluate emotional experiences in design, designers have been using experience-based tools for studying emotions in practice, such as mood boards. Mood boards were developed for communicating emotional qualities between designers and clients, but have not yet been considered as an evaluation tool for investigating emotional experience. In t his study we examined whether design students and non-design students have similar criteria in evaluating these mood boards. The results showed that the inter-rater reliability among all participants were considerably high, which suggested that mood boards are potential to be used as an evaluation tool for research on emotion.

Keywords: mood boards, emotion, evaluation tool, user experience.

1 Introduction

In recent years, the focus of human-computer interaction (HCI) has shifted from functionality and usability to 'humans' [1]. The concept of user experience (UX) is widely embraced by the HCI community and raises many new challenges to researchers and designers [2]. As emotion is an essential part of our mental lives, one of the main challenges is to investigate the emotional aspect of user experience [3], and deliver these observed emotional qualities back to designers for initiating design processes [4]. While many researchers are striving for new tools to investigate emotions in design, designers have been using several experience-based tools for their work and some of these tools may be useful for evaluating emotions.

The use of mood boards is versatile. It has long been used for communicating emotional qualities between designers and clients [5], and the process of mood board making also serves as a resource for creative thinking [6]. While making mood boards has become an essential skill for design practice, we have seen its potential to be a research tool specifically for measuring non-verbal emotional experience. In the present study, we first review the current development of emotion evaluation tools in

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design research, and revisit the procedure of making mood boards from a psychological perspective. Based on this framework, we conducted an experiment to examine the effectiveness of mood boards in expressing emotional qualities across interpretations of people with design and non-design backgrounds, and discuss how this new finding may inform future research on emotions.

2 A Psychological Perspective on Mood Boards

Since emotion is a psychological phenomenon that cannot be directly captured, research on emotion usually relies on a stimulus-response paradigm, which encompasses emotion elicitation and emotion recognition [7]. Researchers are able to infer the emotional quality that is induced in the subject according to the content of the stimuli and the corresponding emotional responses. For example, a subject might have experienced happiness because (1) the stimuli were funny pictures and (2) the subject also reported happiness. This stimulus-response paradigm has directed most of the contemporary psychological research on emotion, and also influenced other related areas, such as design research on emotions.

2.1 Emotion Evaluation Tools in the Design Field

Kansei Engineering [8] was developed as a consumer-oriented approach for new product development. Researchers in Kansei Engineering intend to investigate the relationship between consumers' psychological feelings and product features, such form, shape, color, and any perceptual qualities. Designers can thus generate new product concepts by manipulating product features. This method can also be used to evaluate qualities of new concept at the early stage of design process [9]. The Japanese word 'Kansei' encompasses broad concepts, referring to all of which are conceived as mental responses to external stimuli, including emotion, senses, and aesthetics [8]. Research in Kansei Engineering often uses semantic scales with perceptual and emotional qualities, which may give rise to some concerns about cultural differences and product categories [10]. For example, the expression in Japanese and English on certain perceptual qualities may differ; kitchen appliances and automobiles should use different sets of semantic scales.

Jordan [11] developed a questionnaire specifically for evaluating *positive* emotional experience about products. This questionnaire encompasses 14 questions about specific emotions, such as entertained, excited, and satisfaction. Taking into account the feasibility across products and cultures, this questionnaire provided optional open-ended questions that allowed the experimenter and the subject to add new words. While Kansei Engineering and Jordan's questionnaire focused on physical products, several new evaluation tools for measuring user experience were proposed in recent years. User experience questionnaire (UEQ) [12] used a similar approach to Kansei Engineering but shifted the focus from products to users. Thus, UEQ removed adjectives describing physical appearance of physical products (e.g. shape and color) and included more words for describing cognitive load, emotional feelings and preferences.

While most evaluation tools are intended to derive immediate responses from subjects, a tool called iScale [13] was developed for observing long-term, continuous user experiences. This tool requires users to recall their long-term experiences periodically while using a new product in their daily lives. Unlike other tools using likert scales, iScale takes a novel approach, asking users to draw a curve to indicate the changes in their emotional experiences related to the product. However, this curve-drawing approach does not aim to acquire exact emotional qualities, but to serve as a reference for tracing pleasant or unpleasant events that occurred, which allows designers to 'reconstruct' the past and solve potential problems of the product accordingly.

However, the abovementioned evaluation tools are language dependent. Although the interpretations in affective meaning is universal at a certain degree [14], various modalities of emotional responses are universally valid and might benefit non-verbal emotion communications, such as facial expressions [15]. PrEmo [16] was developed based on this assumption, using facial expressions and body gestures with animated cartoon characters to illustrate different emotional qualities. Subjects could thus fill this questionnaire through self-reports as an instrument for measuring consumers' emotional responses specifically to product appearance.

In addition to the abovementioned tools, there are more new tools released in recent years, e.g. [17, 18]. Most design researchers apply research-based approach to investigate product emotions [4] and endeavor to develop systematic procedures for evaluating emotional experience. However, how to study emotion in design practice is rarely discussed. Over the past years, designers have been using experience-based tools, such as mood boards, to study emotions. Comparing to systematic tools, experience-based tools are usually quick-and-dirty solutions and do not have strict term of use. On the other hand, the validity of experience-based tools is difficult to measure so that this kind of tool is rarely discussed in empirical studies

2.2 Revisiting 'Mood Boards'

Mood boards are a collection of visual images gathered together to represent an emotional responses to a design brief [19]. It is a visual and sensory instrument for designers to communicate with each other and also with the clients [6]. This tool functions as a non-verbal medium communicating complex and delicate emotional qualities that are difficult to express through languages. The process of mood board making can stimulate insightful discussions [6, 19], providing inspirations at the early stage of concept development [9]. In order to support mood board making, various modalities of interactive technologies were applied to developing digital mood board [20], which enable designers and clients to co-create mood boards effectively.

Traditionally, mood board making were solely for designers. Since mood board making is technically easy and simple, some researchers have tried to use mood boards as a catalyst in focus groups [21]. Similar to the *contextmapping* approach [22], mood board making may trigger more inputs from target users and help designers discover deeper insights about user needs and aspiration towards products. This has shown the potential of mood boards to be used as a tool for capturing emotional experiences in different contexts. Today, mood board making has become an essential

skill for designers. Several studies have discussed how to teach and apply this technique in design education [5, 19, 23]. It appears that most designers are trained to translate emotional qualities into mood boards – a visual manifestation that associates with the given content, e.g. products and brands. However, this technique did not gain adequate credits in terms of scientific evidence. It is necessary to assess the validity of mood boards to be an effective tool for studying emotions in design research.

2.3 Mood Boards as an Emotion Evaluation Tool for Designers

A general context of use of mood boards can be illustrated as follows (see Fig. 1). In the early stage of the design process, one of the primary tasks is to define emotional qualities of the new product. To initiate this undertaking, designers usually start with the 'design theme' of the given project, such as the brand image of the client and the marketing position of the new product. After a thorough understanding of the theme, designers can thus make mood boards to visualize predefined emotional qualities. These mood boards serve as part of the key references for later stages of product development. Designers have to discuss with their clients about the mood boards to identify the common goal of the project, and also talk with target users in order to obtain useful insights.

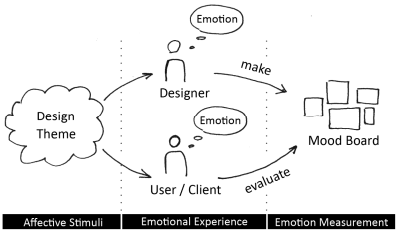

Fig. 1. A psychological perspective on mood board making in design practice

From a psychological perspective, the above process can be decomposed into two stimuli-response processes. The 'design theme' of the given project can be conceived as a mutual affective stimulus to bot designers and users/clients. After both of them have been primed with the emotional experience, designers make mood boards as a self-report outcome, and then users/clients provide their evaluation according to their subjective emotional experience. Designers need to modify their mood boards until a certain consensus has been built.

A preliminary studies have revealed that design students share a common perception of mood boards [23]. The author recruited a group of design students to create mood boards according to two general terms, 'masculine' and 'feminine', and asked them to give ratings to the mood boards created by other students depending on how well the mood boards represent the concept of masculine and feminine. The results suggested a consistency for both male and female students in terms of the concept of 'masculine' and 'feminine'. This finding is promising, but numbers of concerns need to be taken into account in order to prove the validity of mood boards as a useful tool in a more complex design task.

First of all, it is necessary to verify if mood boards are emotionally meaningful for both designers and users/clients (i.e. individuals who are not trained as a designer). While most designers are trained to make mood boards, they are also *experienced* in interpreting and justifying mood boards. Although mood boards are assumed to be a non-verbal emotional communication tool, it has not yet clarified if users share the same underlying criteria in justifying mood boards with designers. In order to apply mood boards as a universal tool for evaluating emotions for the general population, it is important to examine whether mood boards can be self-explained affective content to both designers and users.

Second, in the study of [23] the raters (i.e. the design students) also participated in the task of making mood boards. This would lead to a priming effect because the raters had thought attentively about the themes for creating mood boards, and would have anticipated what elements might be included in the final mood boards. We propose to include users as the role of rater in order to avoid priming effects, and this setting is also closer to how mood board making is applied in design practice.

Lastly, the stimuli for eliciting emotions in designers and users should be more immersive, emotionally rich, and generic. Most previous studies used static pictures to demonstrate the visual appearance of products, such as color, shape, and materials [8, 16]. However, this content is too feature specific, and is not suitable for the early stage of product development. Moreover, the selection of media type should also be taken into account. Several psychological studies have suggested that film clips are an effective media type for eliciting emotions [7, 24, 25]. Film clips are relatively short, intuitively powerful, and easily accessible; the clips and the procedure for viewing them can be standardized across participants [26].

We consider TV commercials as a proper resource for affective stimuli in our study. TV commercials have long been used in research on emotions specifically for consumer psychology [27]. TV commercials are suitable for our research because affective reactions to TV commercials are highly related to buying behaviors [28] and the symbolic meaning of advertisement is an essential element in visual communications between products and consumers [29]. Moreover, mood board making is closely related to the brand image of the product as it is often used in the early stage of product development [21].

The logic of our study is as follows. TV commercials of specific brands serve as affective stimuli. At the first stage, several professional designers would be recruited to create mood boards for each of the selected commercials. Mood board making in the present study should focus on the emotional qualities rather than design features. The mood boards are considered as representations of the emotional qualities delivered by the TV commercials. In the second stage – the experiment – participants are presented with the same TV commercials. After watching each commercial, participant need to compare their emotional feelings with the emotional qualities represented by the mood boards and gives rankings based on their subjective evaluation.

3 Making Mood Boards

The products of the TV commercials should belong to the same category in order that the results for the two commercials can be comparable. Two TV commercials of

automobile brands, BMW [30] and Jeep [31], were selected as affective stimuli. Both of these two commercials were one minute long. The content of these two commercials represents feminine and masculine images based on the definition of Jungian theory of archetypes on Anima and Hero [32]. The selection process followed our previous work on analyzing symbolic meanings in modern movies [33].

Twelve Taiwanese professional designers were invited to participate in mood board making. They first watched one of the two commercials and created an image-only mood board, and repeated the same task for the other commercial. The display of the two commercials followed a random order. Designers were asked to make mood boards to describe their own emotional feelings about the content of the commercials and ignore their preoccupied impressions about the brand and its product features. In order to standardize the resources they used for creating mood boards, an online mood board making software called 'moodshare' [34] was used to perform the task. Therefore, 24 mood boards were created for the later experiment.

4 Experiment

While it has been revealed that mood boards are valid for designers, in this experiment we intended to verify whether non-design students and design students gave similar rankings over mood boards. If the answer was positive, mood boards could thus be useful for investigating emotional experience among individuals who were with or without a design background. A qualitative questionnaire was applied to collect more information about the criteria for justifying the quality of the mood boards.

Our experiment was conducted at the Usability Laboratory of CETpD research center at the Polytechnic University of Catalonia, and the design studio of the Department of Industrial Design at National Taiwan University of Technology. There were 36 design students and 16 non-design students, including 25 Females and 27 males, volunteered to participate in our experiment. The average age of the participants was 24.46 years old (SD = 4.96). The students were originally from 11 countries; 22 participants were from Asia; 26 were from Europe; 4 were from South America. The experiment followed a within-subject design. Each session accommodated one participant and thus every participant performed all the tasks respectively.

4.1 Procedure

The procedure of our experiment is as follows (see fig. 2). Firstly, an introduction was given to the participant and the participant needed to fill in an informed consent form for the experiment. After signing the agreement, the participant was seated in our laboratory, which was arranged as a usual living room to make the participant feel comfortable and relaxed. The visual part of the video was projected onto a white wall (display dimensions are 3m x 2m) while the audio part of the video was delivered via wireless headphones. When the above setting was ready, the light in the laboratory was dimmed in order to make the participant more immersed in the video presentations. The two TV commercials were play in random order. After finishing viewing

one of the videos, the participant was then asked to fill the questionnaire. The questionnaire encompassed two parts; the first part was providing keywords to describe his or her emotional experience about the video; the second part was to rank mood boards according to the participant's own emotional experiences about the video.

Fig. 2. The procedure of the experiment. First, the participant watched one of the two commercials, wrote down keywords and then gave rankings for mood boards. The same order repeated for the other commercial.

The keywords served as qualitative data that represented the participant's perceived emotional qualities and denoted the prominent elements that attracted his or her attention. The participant was asked to focus on the content of the video rather than the brand of the commercial although the influence of the brand of the commercial might still affect the judgment of the participant. After this part of questionnaire was finished, the participant was led to the wall that presented mood boards corresponding to the given commercial. All the mood boards were presented at the same time in order to provide an overview, and the participant could look closer into each mood board to give rankings. The mood boards were created earlier by professional designers in the first stage, representing the emotional qualities that were perceived and expressed by them. The participant was asked to give rankings for the 12 mood boards for each commercial according to his or her overall viewing experience. The mood board that was most relevant should be ranked as number 1, and the second relevant as number 2, down to the least relevant which is number 12. The participant performed the same task for both the two commercials respectively.

4.2 Results

In most cases, a Pearson correlation is a valid estimator of inter-rater reliability, but only when meaningful pairings are available between two raters, but it is not suitable for more than two raters. An intra-class correlation (ICC) was developed for estimating inter-rater reliability on quantitative data [35]. We applied the analysis on intra-class correlation using a two-way-random, average-measure model. The results indicated that the inter-rater reliability among all rankings given by all participants is remarkably high ($ICC(2, 52) = 0.939$, $F(23,1175) = 15.7$, $p < 0.001$, 95% confidence interval for ICC population values: $0.898 < ICC < 0.969$), which indicates that design and

non-design students showed similar opinions on how the mood boards matched their emotional experience. In order to examine if there are significant differences between the rankings of mood boards, we used a non-parametric repeated-measures analysis of variance, i.e. the Friedman Test. For the mood boards of BMW commercial, a Friedman test revealed a significant effect of Group on Value ($X^2(11) = 60.461$, $p < 0.001$). Similarly, the same test on the rankings for the mood boards of the Jeep commercial also revealed a significant effect ($X^2(11) = 198.855$, $p < 0.001$). The results suggested that there are significant main effects on the rankings of the mood boards for the two commercials respectively.

Table 1. The results of the descriptive analyses and the post-hoc test for pairwise comparison on the rankings for the mood boards. Twelve designers participated in this study (ID alphabetically ranging from A to L). Only the top 3 and the bottom 3 of the twelve mood boards are reported.

	BMW Commercial (Anima)			**Jeep Commercial (Hero)**		
	ID	Ranking	Post-hoc	ID	Ranking	Post-hoc
Top 3	K	4.80 (SD=3.23)	K-H: p = 0.003 K-B: p < 0.001 K-C: p < 0.001 E-H: p = 0.006 E-B: p < 0.001 E-C: p < 0.001 D-H: p = 0.028 D-B: p = 0.002 D-C: p < 0.001	G	3.65 (SD=2.79)	G-H: p < 0.001 G- I: p < 0.001 G-C: p < 0.001 K-H: p < 0.001 K- I: p < 0.001 K-C: p < 0.001 E-H: p < 0.001 E- I: p < 0.001 E-C: p < 0.001
	E	4.92 (SD=3.17)		K	3.80 (SD=2.87)	
	D	5.22 (SD=3.01)		E	4.33 (SD=3.25)	
Bottom 3	H	7.57 (SD=3.13)		H	8.82 (SD=2.45)	
	B	8.02 (SD=3.25)		I	9.55 (SD=2.60)	
	C	8.43 (SD=2.68)		C	9.88 (SD=2.44)	

Thus, we proceeded to post-hoc analyses. The Wilcoxon-Nemenyi-McDonald-Thompson test was developed specifically for a post-hoc test that enables pairwise comparisons for non-parametric repeated measures data [36]. In Table 1, we presented the results of descriptive analyses and the pairwise comparisons between the top three and bottom three mood boards for both two commercials. It needs to be noted that each of the top three mood boards is significantly better than any of the bottom three mood boards. It is noticeable that part of the top three and bottom three mood boards for BMW and Jeep commercials were made by the same designers (designer K and E in top 3;designer H and C in bottom 3). The top ranked mood boards for the two commercials are presented in Fig. 3 and 4. It can be seen that the numbers of the images included in each mood board are different. We performed Person's Chi-squared test to examine if there is a significant correlation between the number of the images in a mood board and its ranking. The results showed that there was a negative correlation between the numbers of images and rankings ($r = - 0.17$, $n = 1224$, $p < 0.001$). The results were reasonable because more images could accommodate richer information that communicates trivial emotional qualities.

Fig. 3. The top ranked mood board for the BMW commercial (by designer 'K' in Table 1.)

Fig. 4. The top ranked mood board for the Jeep commercial (by designer 'G' in Table 1.)

Table 2. The keywords provided by the participants for the two commercials, ordered by the average counts of the appearance of the words in the coding themes

BMW Commercial (Anima)		
Theme	Average Counts	Examples
Superior	1.31 (SD=1.39)	Modern, Admirable, Quality, Aesthetic, Stylish, Art
Home	1.25 (SD=1.19)	Relaxing, Happy, Comfort, Safe, Enjoy, Life, Warm
Sensual	1.19 (SD=1.34)	Breeze, Air, Floating, Soft, Vibration, Smooth, Gentle
Elegance	1.10 (SD=1.09)	Tranquil, Calm, Peace, Harmonious, Slow, Steady
Nature	1.08 (SD=1.45)	Freedom, Liberty, Adventure, Explore, Wild, Jump
Strength	1.00 (SD=1.07)	Velocity, Power, Momentum, Sprint, Streamline, Intense
Feminine	1.00 (SD=1.31)	Emotional, Attractive, Desire, Sexy, Dream, Reminiscing
Jeep Commercial (Hero)		
Craft	1.52 (SD=1.42)	Handmade, Perfection, Concentrate, Texture, Precision
Strength	1.25 (SD=1.52)	Fight, Strong, Rise, Tension, Heavy, Robust, Force
Trials	1.19 (SD=1.68)	Strive, Lonely, Challenge, Battle, Pain, Sweat, Frustrated
Hero	1.08 (SD=1.22)	Epic, Brave, Passion, Determination, Honest, Honor
Rebirth	0.79 (SD=1.04)	New life, Achievement, New horizon, Job well done
Mental	0.77 (SD=1.06)	Expectation, Projection, Motivation, Ambitious, Intention

The keywords given by the participants serve as references for inferring the underlying criteria that were used for ranking the mood boards. We applied the Ground theory to code the keywords in order to identify various themes [37]. After coding, we conducted a descriptive analysis on the numbers of appearance of words in each theme (see Table 2). It can be seen that the participants rarely refer to certain emotional qualities directly, but used a large amount of sensory words, analogies, and metaphors. Combining the keywords in the same theme allowed us to associate the emotional qualities perceived by the participants, e.g. the feeling of being home.

5 Discussion

These preliminary results have confirmed the reliability of using mood boards as a tool for investigating emotional experience among a general population. Furthermore, since the mood boards used in our study were made without adding any text, it has revealed the capability of mood boards to express non-verbal emotional qualities. Traditional research on emotion tends to use *direct* measurement, such as self-reports on specific emotional qualities, such as 'excited'. Although this approach is effective in most cases, it is prone to filter out trivial emotional qualities that are difficult to express through languages. It seems that mood boards are potential to be a useful alternative measure that applies an indirect approach, using visual images as cues for associating complex, trivial emotional qualities. Since mood boards are language independent, it may overcome the limitation of traditional approaches.

Designers are usually assumed to be more sensitive to affective content than users and clients because designers are more experienced in visualizing emotional qualities. However, it appears that users and clients also share similar criteria for judging visual affective content. This is probably because judging mood boards mainly relies on *association* and *intuition*. The nature of mood boards is sensorial, experiential and rich in content; interpreting the emotional qualities in mood boards cannot be logically reasoned. This also resonates with several psychological studies [38].

6 Conclusion

The present study has shown the potential of using mood boards as an evaluation tool for studying emotional experience. Mood boards are a generic tool that is applicable in various contexts of use and most designers are familiar with this tool. For future work, applying mood boards in research on user experience is a promising direction to proceed. Investigating the relationship between design content and corresponding emotional qualities is also another intriguing topic worth researching.

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