Research on the Influence Factors of Designer's Emotion in the Design Process

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Abstract. The emotional change of a designer may lead to a different design decision and therefore affect the outcome of the design. This paper aims to explore factors that affect the emotions of designers during the design process. To be specific, through the method of multi-level screening, three experiments were performed, including the preliminary screening of 435 emotional words, the study on the relevance of designer emotions to the design process, and the semantic similarity analysis of emotional words, after which the set of 29 frequently-used words concerning designer emotions was constructed. Further, the factors and conditions that affect the emotional state of designers were summarized based on 1069 textual messages of emotional experience in a retrospective interview. The results show that the five major factors that cause the emotional change of designers are the state and capacity of designers themselves, interpersonal interaction and evaluation, external resources and environment, progress and content of the project, and the performance and innovation of tools, while 15 minor influencing factors were identified as well. Finally, four strategies were proposed to promote positive emotions during the design process from the perspective of design organizations and designers. By studying reasons for emotional state changes of the designer, the paper proposes a new perspective of self-understanding and self-examination for designers and the achievement of this research may offer valuable guidance for the practice of emotion management in design organization.

Keyword: Emotional state · Designer · Influence factors · Emotional word set · Design process

1 Introduction

For designers, the design process is one of the main areas that require emotional input. Previous research has indicated that the emotional change of a designer may lead to a different design decision and therefore affect the outcome of the design. For instance, Desmet [1] argues that pleasant emotions have a positive influence on design practice and could help improve the quality of final design products. Dorst [2] describes the ideas or opinions that pop up during a design task as a highly emotional step that is impossible for any designer to ignore. Likewise, Ho [3] proposes that the emotional change of designers affects their ability to process information and finally results in variations in design results. Therefore, to ensure the smooth running of design projects

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and the high quality of design outcomes, factors that influence the emotional status of designers deserve to be further studied.

Existing studies on design-related emotions practically focus only on user perceptions of design results, with little attention paid to the personal emotional experience of designers during design practice [4], while the very few studies that explore the causes of the emotional changes mainly touch upon general components. Forlizzi [5] notes that changes in the external environment can lead to the different emotional status of designers. Based on the questionnaire survey on 120 students, Ho [6] concludes that the changes in designer emotions can partly be attributed to unexpected factors caused by technological change and those related to the external environment that are beyond the expectations of designers. It is noticeable that current exploration on factors that influence designer emotions lacks specificity and comprehensiveness, as well as recognition of high-frequency emotions in the design process. Therefore, this paper takes on the perspective of designers to explore the common types and sources of emotions that occur in the design process, aiming to provide new insights into emotion self-examination and management for designers and design organizations.

2 Study 1

To study the factors that influence designer emotions, above all it is necessary to identify those emotions that frequently appear in the design process. Therefore, in this section, the method of multistage screening was used for experimenting to retain the emotional words that frequently appear in the design process, based on which the high-frequency word set was constructed.

2.1 Method

As the study involves only Chinese designers, both the questionnaire and conversations in the experiment are in Chinese. Among the vast number of words in the Chinese language, researchers once teased out 435 words that cover almost all the emotions [7], which serves as the basis for the multistage screening in this paper. The steps are described as following (Fig. 1. Specific experimental steps).

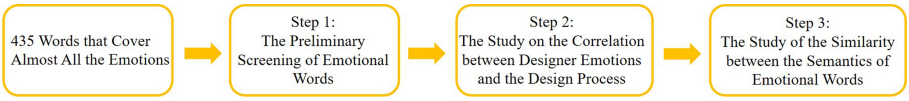

Fig. 1. Specific experimental steps

The first step is the preliminary screening of emotional words. Ambiguous or obscure words were removed from the 435 emotional words to make sure the samples studied would be semantically comprehensible and accurate. The participants include 90 Chinese designers, who come from random educational backgrounds and professional environments. The survey was conducted in the form of online questionnaire. The participants

were asked to review the 435 emotional words successively to decide whether they are clear and easy to understand. They submitted their answers within two days by choosing "yes" or "no".

The second step is the study on the correlation between designer emotions and the design process. Among the emotional words in the set obtained from preliminary screening, some appear frequently in the design process due to the stimulation of various factors in the design process, while others do not. Therefore, it is necessary to screen out emotional words that are strongly associated with the design process. In this step, 84 participants were recruited, all of them are designers with experience in at least one entire project. During the experiment done separately on each, the subjects recalled the scenes during their involvement in design projects and selected those words from the remaining emotional words that they believe can be stimulated by activities related to the design process. Real-world work experience ensures a high level of validity of that judgement.

The third step is the study of the similarity between the semantics of emotional words. After two rounds of screening, some of the emotional words that remained still have problems of semantic similarity or are not precisely used for describing design emotions, making it necessary to conduct semantic analysis and clustering-based screening. Thus, a Doctor of Chinese Language and Literature and a Doctor of philosophy were responsible for screening the remaining emotional words. First, words not precisely used for describing design emotions were removed. Then, the remaining words were semantically compared in pairs and those sharing similar meanings were put in one group. In each group, the one that was selected most frequently in Step 2 was retained, while others were deleted.

2.2 Results

A total number of 90 questionnaires were obtained from Step 1. Preliminary screening was performed on the questionnaire results based on the criterion that at least 90% participants chose "yes", after which 274 easy-to-understand emotional words were left.

84 valid results were obtained from Step 2. Before proceeding to screen out the high-frequency emotional word set in the design process, this paper gave a definition to "high-frequency" first. A word is considered highly frequent when it has been selected by more than 58 times, which is to say, over 70% subjects experienced the emotion during the design process. A statistical analysis was done on valid results to obtain 70 high-frequency emotional words.

In Step 3, 7 words that are ill-suited to this study, namely, not precisely used for describing design emotions, were removed and 15 groups of similar emotional words were picked out through clustering. To ensure the conciseness of subsequent research samples, based on the results of Step 2, only the most frequent word in each group was retained.

After the screening conducted in the three steps, the condensed 29 emotions were obtained finally to form the set of high-frequency emotional words in the design process (Table 1), including 12 words of positive emotions and 17 ones of negative emotions.

Table 1. High-frequency word set of designers during the design process

Anxious	Admiring	Anticipating	Assured	Bored
Cheerful	Confused	Delighted	Depressed	Disorientated
Doubtful	Excited	Fretful	Frustrated	Gratified
Impatient	Inferior	Nervous	Powerless	Relaxing
Relieved	Regretful	Remorseful	Smug	Stressed
Touched	Unsettled	Vexed	Worried	

3 Study 2

The essence of studying factors that influence designer emotions is to externalize those emotions and to reveal their feelings and the causes of the change using emotional words and experiences. This section involves a retrospective interview on designers. Based on the statistic results, the sources of emotions were summarized and categorized.

3.1 Methodology

42 participants were recruited in this experiment, including 23 males and 19 females, all of whom are designers familiar with project processes and experience in at least one entire project. The study was performed separately in the form of structured interview. The host showed the 29 selected emotional words successively to the subjects and asked them to recall and describe the experience and event that triggered a certain emotion. A word can be skipped in the absence of related experience. The experimental process was saved in the format of audios.

After the interview was completed, all audio materials were converted into text with the method of natural language processing, and each piece of emotional experience was categorized. According to the context, the emotional words were put into the emotional category, and the causes that triggered emotions into influencing factors. Finally, the phases in which emotions appeared were categorized as project establishment, product design, design evaluation, and production preparation. The point is to highlight: in addition to the establishment, the phase of project establishment also includes the definition of design issues, judgement of design requirements, drafting of design criteria, and pre-execution analytical survey; the phase of product design includes the conception and expression of design ideas, which involve creative thinking; the phase of design evaluation primarily evaluates the design scheme and proposes suggestions for revision; the phase of production preparation is a transitional step with main activities of liaising with downstream engineers. For instance, an example of emotional experience was “I feel impatient if during model rendering my computer quits unexpectedly and start some time-consuming updates. As the causes of emotions, “quitting unexpectedly and time-consuming updating” fits into influencing factors. As the expression of design ideas, “model rendering” fits into the phase of product design, and “Impatient” into the emotional category.

3.2 Results

1,069 textual messages were acquired from the experiment. After useful information in each piece was stripped, the results of statistical analysis were as follows.

- "Anxious", "Relieved", and "Impatient" are top three words that evoke related experience, with 53, 50 and 46 emotional cases recalled respectively. By contrast, "Touched", "Regretful", and "Powerless" evoke the least number of emotional cases—30 for each (shown in Fig. 2). However, overall, each emotional word evokes the emotional experience of at least 70% (30) participants, which reflects that those emotions are indeed frequently experienced by designers.
- In the four steps of the design process, creative activities serve as a stronger stimuli of emotional experience than analytical activities do. The number of emotional cases in the phase of product design is far greater than in the other three phases, accounting for 50% of the whole design process.
- In the phase of project establishment, the most frequent emotions are "Confused", "Disorientated" and "Anxious", mainly due to lack of knowledge or unfamiliarity with external information resources. In the phase of product design, "Impatient", "Bored", and "Gratified" are the most frequent emotions, under the influence of various factors, such as the status of inspirational thinking and design capacity. In the phase of design evaluation, comments from other members on design works will cause emotions like "Delighted", "Excited", and "Frustrated". In the phase of design preparation, when part of the design work is about to end or the final design product will be unveiled, emotional words like "Anticipating" and "Unsettled" frequently appear.

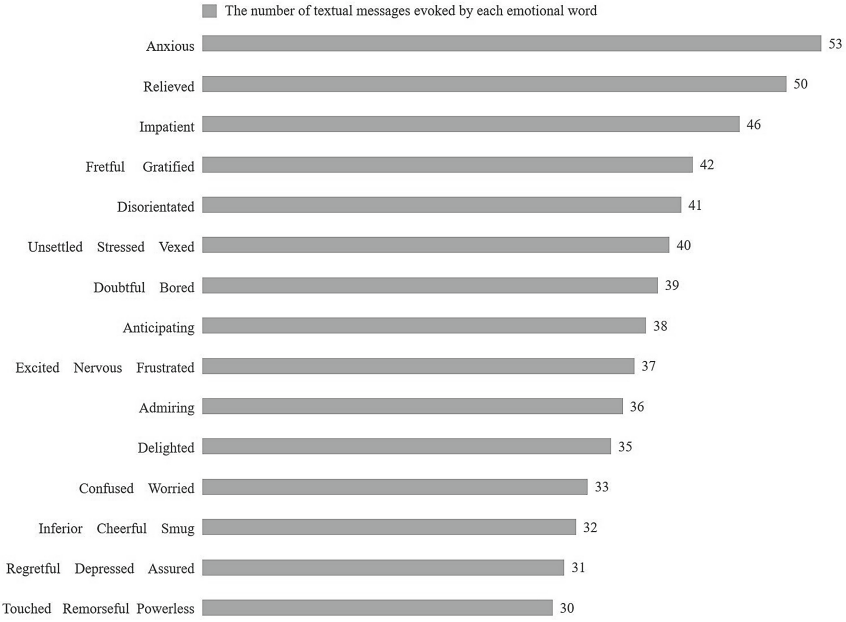

Fig. 2. The number of textual messages evoked by each emotional word

4 Discussion

4.1 Influencing Factors of Designer Emotions in the Design Process

An analysis was performed on the 1,069 pieces of emotional experience categorized as influencing factors to summarize five major categories and 15 items, which were identified as dominant influencing factors (listed in Fig. 3). Details of the discussion are presented below.

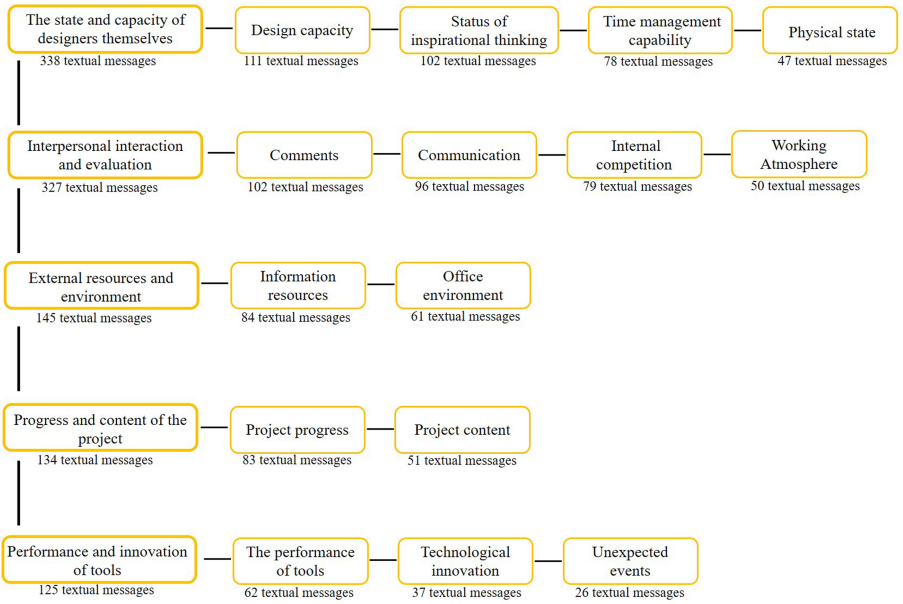

Fig. 3. Influencing factors of designer emotions in the design process

The State and Capacity of Designers Themselves. *Design capacity, status of inspirational thinking, time management capability and physical state* affect the emotions of designers. This category mainly discusses how the physical and mental state and comprehensive qualities of designers affect their emotions. The influence of design capacity is often manifested in the expressiveness of design. 111 textual messages involve information like "I'm not able to fully express my ideas in modelling" and "I cannot render out the real effects". In the stage of product design, inspirational thinking, a way of thinking that is contingent and creative, is an important factor that affects designer emotions. Active inspirational thinking provokes positive emotions such as "Excited", "Delighted" and "Smug". Otherwise, negative emotions will occur, like "Frustrated" and "Depressed". Moreover, sometimes due to poor time management, designers experience emotional fluctuations when a deadline is approaching. Therefore, the use of relevant information, tools, and approaches should be properly planned in advance to facilitate the achievement of design goals. In the textual information, the physical state of designers is related to

their duration of work. After working long hours, they are likely to experience negative emotions like "Anxious" and "Depressed" that in turn affect their work efficiency.

Interpersonal Interaction and Evaluation. *Comments, communication, internal competition, and Working atmosphere* may lead to changes in designer emotions. This category mainly discusses how the connections established with other members and comments from them affect the emotions of designers. The emotional change of designers is most commonly associated with comments given on the design scheme by relevant people. Favorable comments bring positive emotions. The clearly-defined requirements and smooth communication between members provide positive emotional feedback for designers, therefore helping enhance design efficiency and outcomes. Meanwhile, the social stimuli of competition between teams makes designers feel nervous or smug. 34 textual messages mention that "I feel sort of smug when having the upper hand in the competition in my team." Working atmosphere mainly refers to the level of harmony between team members, which is positively related to positive emotions.

External Resources and Environment. *Information resources and office environment* may affect designer emotions. The lack of information related to the design project will provoke negative emotions in designers—one example is "I feel anxious when failing to get the information needed." Meanwhile, the office environment has a significant effect on designer emotions. Working in a bright, quiet and green environment can trigger positive emotions more easily.

Progress and Content of the Project. *Project progress and content* may cause changes in designer emotions as well. When the project is about to be accomplished or has arrived at a key point, there is invariably a change in designer emotions. For instance, emotional experiences like "I feel relieved after finishing reporting to the client" and "I feel delighted near the end of the project" were mentioned in the textual language. Besides, designer emotions are directly affected by the level of difficulty and fun of their tasks. 51 textual messages involve similar cases like "The boring work of organizing user data repeatedly makes me fretful", and "if the project is simple, I will be quite relaxing".

Performance of Tools and Innovation. *The performance of tools, technological innovation and unexpected events* affect the emotions of designers. This category mainly discusses the influence of the performance and status of tools on designer emotions. The conditions of design software, the operation speed of computers, the emergence of new software, and unexpected failures of design tools can provoke the different emotional experience of designers.

4.2 Strategies to Promote Positive Emotions in the Design Process

Designers who maintain positive emotions in the design process are more capable of processing information in a clear and reliable way, thinking actively and creatively, and producing design results of higher quality [8, 9]. Therefore, strategies need be developed to help designers maintain positive emotions in the design process. Based on the actual

application of the research results of influencing factors, this paper puts forward four strategies to enhance positive emotions in the design process from the perspective of design organizations and designers (Fig. 4).

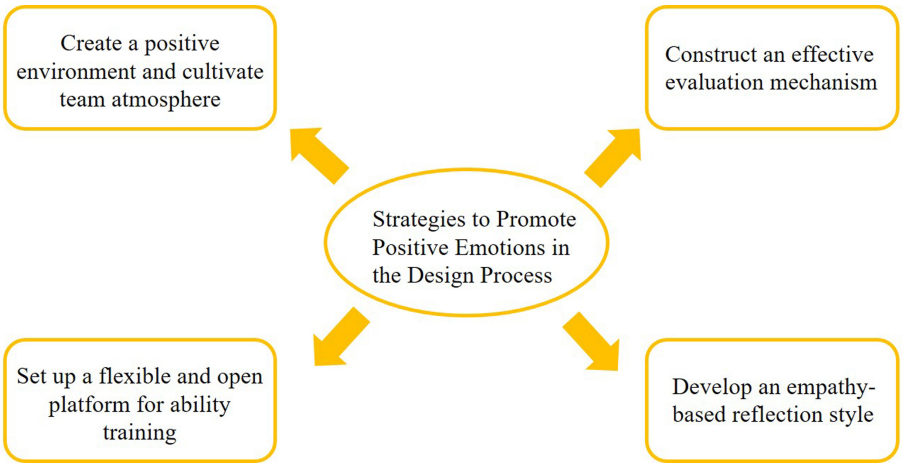

Fig. 4. Strategies to promote positive emotions in the design process

Create a Positive Environment and Cultivate Team Atmosphere. Martens [10] believes that design thinking should be completely visualized and presented in the work space. A collaborative, open work environment contributes to the development of creative thinking and the formation of positive emotions [11, 12]. Design organizations can create a proper work scenario by improving the functions of different types of space including individual space, cooperation space, production space, exhibition space and leisure space, enhancing the layout of space including flexibility, privacy and complexity, and adjusting physical elements like furniture, plants, views, sound, colors, lighting, temperature, and smell, so as to help maintain positive designer emotions. Meanwhile, it is also recommended that design organizations try to create a positive team atmosphere to promote the effectiveness and feeling of pleasure in team collaboration.

Construct an Effective Evaluation Mechanism. External evaluation is one of the factors that affect the emotions of designers. During the evaluation and decision-making of a design project, ambiguous criteria or evaluation based on subjective opinions will trigger negative emotions in the designer, such as “Disorientated”, “Powerless”, “Vexed” and “Confused”. To ensure that the design results are scientific and objective, design organizations should strive to construct a multi-dimensional evaluation mechanism that works for the project by conducting an in-depth analysis of design goals in different phases, taking into account the diverse experiences and opinions of different roles, utilizing technologies like big data and artificial intelligence, avoiding the negative emotions of designer caused by an unreasonable evaluation mechanism.

Set up a Flexible and Open Platform for Ability Training. Design capacity and the state of inspiration have the biggest influence on the emotions of a designer, which indicates the significant effect of learning on design. Design organizations need to set up a flexible and open mechanism for ability training to ensure the flow of creativity and precise expression. For instance, regular training on software skills could be organized to help enhance proficiency with expressing tools, while polishing creative thinking skills to solve the problem of inadequate inspirational thinking. The training of these abilities contributes to the improvement of designer confidence and competence and therefore promote the formation of positive emotions.

Develop an Empathy-Based Reflection Style. While common ways to regulate emotions like distracting, self-rewarding, modifying demands, consuming physical strength, and seeking solace still work for designers, empathy-based reflection is a strategy for emotion regulation that particularly suits the needs of designers. The first step is to improve the empathy of designers, namely, their ability to share the feelings and emotions of other people, which allows them to analyze design goals at greater depths, to understand user experience and to better communicate with other project members, because designers with stronger empathy can perceive more keenly the intentions, preferences and values of others, and are able to timely regulate their own emotions and to facilitate more effective team communication. The second step is to develop an empathy-based reflection style to reflect upon relevant issues in the role of both the user and the designer, so as to obtain design experience based on a deep understanding of user experience, helping solve the problem of insufficient inspiration through the accumulation of experience. Meanwhile, the reflective mechanism will lead to a better understanding of the significance of interpersonal connections and deeper insights into the scenarios where a certain emotion can occur as well as the sources of emotions, therefore realizing the control and management of emotions.

5 Conclusion and Future Work

The study on the influencing factors of designer emotions during the design process helps designers recognize their own emotional state and the factors influencing it, while relevant strategies could be implemented to enable them to manage their emotions, which lays a foundation for quality design results. Moreover, it provides new insights to companies and design organizations, namely, paying attention to the emotional state of designers and offering more emotional support for them—after all, designers are the source of creativity.

Random experiments were conducted on a specific target group in this paper, involving a large number of experimental samples, from which authentic and valid results were obtained. Meanwhile, it should be mentioned that the current research is rather explorative, which may lead to incomplete conclusions. Plenty of previous studies take on the perspective of users to explore the relationship between user emotions and products, with rare examining the relationship between emotions and designs from the perspective of designers. Therefore, future research might focus more on the exploration of the relationship between designer emotions and design results based on the achievements of this paper.

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