The Role of Emotion in Designing Self-tracking Visualization: Where Avatars are Better Choice than Dashboard

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Abstract. The interface design of self-tracking technology still has a lot of room for improvement. At present, self-tracking products with the dashboard as the main interface face challenges in negative user experience and high abandon. In this paper, we try to improve the user experience of such technologies by paying more attention to the role of the user's emotions on the visualization and enhance their willingness to continue to use. Based on our previous study on people-centered self-tracking system design, we think the avatars should be a better choice than dashboards of self-tracking technologies. In order to detect whether avatars can bring more positive emotions than the dashboards, and to reduce abandon, we designed and implemented three phases of usability testing: a questionnaire of popular self-tracking applications in the market, a self-tracking product emotional research based on avatar and dashboards, and a questionnaire based on self-tracking APP prototype with avatar template. Through these usability testing, we obtained results that users are more tend to adopt the avatar one. This paper then proposed results that 9 emotions are significantly different when using these two different interface designs of self-tracking visualization. With such results of research, two implication for principles of sustainable interaction design of self-tracking applications had been proposed in this paper as 1) Understandability; 2) Performance optimizations. We hope to provide a new form of visualization for the interface design of self-tracking technology and complement usability research results of such design.

1. INTRODUCTION

More people convert their everyday experience into data, a phenomenon called self-tracking[1], it is important for self-tracking technologies researchers and designers to consider how to provide positive user experiments and social impact through everyday approach, as digital and internet technologies are shaping people’s daily life[2]. Daily used smart health devices and technologies like Fitbit bracelet and APP, Xiaomi bracelet and APP are using the dashboard as basic interactions. This paper develops an interaction design based on the Avatar Template of self-tracking applications and further demonstrates that avatar design could arose positive emotions from users and promote their willingness to adopt and sustain use through results of the emotional user research and questionnaire surveys.

The Internet of People (IoP) is a radically new Internet paradigm, where the humans and their personal devices are not seen merely as end-users of applications, but become active elements of the Internet[3]. As we proposed in[4], co-creating avatars can represent the well-being of an individual, so that her or his well-being status can be visualized as an avatar ready to be inspected by the individual
and those who care, and a more balanced relationships model called “maker-user-viewer model” can be established, by which we present a new interaction design that anticipating IoP.

This paper is further research of our previous work. In this paper, we make an application prototype basic on the avatar template, which not only represents the well-being status of users but also shows relationships between human health and environments. Moreover, cultural and gender implications also are visualized by the avatar. Four user research had been done according to prototype, and therefore the sustainable design principles for self-tracking application have been summarized.

2. PROTOTYPE DESIGN & UX RESEARCH RESULTS

2.1 Stage 1: Questionnaire Survey on Dashboard Template

The In the first stage, we gathered information about using situations of dashboard template. A questionnaire survey had been done base on interactions of iPhone Health APP, Xiaomi Health APP, Huawei Health APP, which are popular self-tracking applications in China, and all dashboard-based. Participants were asked to observe and use the dashboard template applications and filled in the questionnaire survey. The questions referred to both cognitive and behavioral effects of dashboard template. The procedure took 20 minutes per participant.

Participants

Fifty-one individuals (30 women) participated. The sample’s mean age was 21 years (min. = 20, max. = 22). The participants were students of the Internet and New Media Program at an university in Guangzhou China. They received no compensation for their participation. All of the participants have experience of using self-tracking products and technologies related. The proportion of self-tracking devices usage like Xiaomi Bracelet, Fitbit or Huawei Bracelet is 9.8%; number of self-tracking APPs like Xiaomi Health APP, Huawei Health APP, Fitbit APP is 29.41%; number of preloaded self-tracking APPs in mobile like iPhone Health is 41.18%; Usage of “Step Counter” function of WeChat or QQ is 84.31%.

Reflection on the stage 1

Based on the results of the questionnaire survey and feedbacks collected from anticipants with their daily-used self-tracking products, some reasons of rejection and quick-abandon of self-tracking products had been indicated and analyzed. To summarize, the key problems of self-tracking products are 1) dashboards fail to present a comprehensive healthy state to users, 2) data cannot be understood and be considered as useful to some users, 3) users’ psychological, aesthetic and social preferences are overlooked (“I hope the interfaces can be customized with gender.” “I hope the APP can allow me to share with my friends and families.” “Sharing a picture of some data to my WeChat is meaningless.”). Since the focus of this research is interactions, mostly dashboard templates related, other reasons for rejections like invasion of privacy were not considered in this study.

2.2 Three Needs of Users

As According to the results of questionnaire survey on dashboard template, we further summarized three needs of users of self-tracking technologies in interactions as following:

2.2.1 An interaction to understand healthy status.

As most interactions of self-tracking products are piles of detail data and trendlines in dashboards, which asks for clinical knowledge to fetch information and analyze the comprehensive health status. In this consideration, we believe such interactions is technology-centered clinical approach, in contrast to an everyday life approach.

With a social theory that everyday approach should consider how digital and internet technologies are shaping people’s daily life[2], we believe everyday interactions design should consider the understanding ability of dashboards of users, especially the elder, the young and those without clinical
knowledge. The priority need of everyday life self-tracking products is to know the health status instead of detailed data.

Therefore, an interaction of an everyday life approach should be designed for self-tracking products. With a more positive impact on developing the capacity of self-knowledge and self-management, self-tracking products can then be less regarded as technology-centered clinical instruments, but more seen as helpful infrastructure components for self-management and caring for others.

2.2.2 Eager for social connection and sharing.
As people “seek to share these occasions, not just cementing their bonds through photos in social media, but also generating a sense of being together online”[2], the phenomenon called sociability of the internet in every life, users of self-tracking products also have such eager to share and to co-presence in social media.

In the questionnaire survey in state 1, participants provide some feedbacks that they would like to share their health data with friends and families; but the result of question 3 “As the share function can share a picture of data of steps, kilometers and calories to social media, would you like to use it?” (See Figure 1), the proportion of participants who would like to use this function is only 31.37%. It can be speculated that users were not rejecting sharing data of self-tracking with others, but rejecting such interaction (a picture with a few data) as they consider it meaningless.

Therefore, eager for social connection and sharing should be considered when designing self-tracking products, as users’ needs of caring for others and co-presence is the sociability of internet in every life.

2.2.3 Interactions for gender, aesthetic and social preferences.
Users’ gender and aesthetic preferences have been considered in many products in visual design, such as different colors, shapes and patterns. But we still found that there is potential in incorporating gender, aesthetic and social preferences in interaction design of self-tracking products, such as customized functions for female and male.

In [4], we proposed a co-creating avatar template which may better embody psychological status and well-being of an individual, and can show relationships between human healthy and environments, for example, fish and water. In this study, we make a prototype of a self-tracking APP with avatar and execute an emotional UX research base on it. By this new design of interaction, we hope individuals’ gender, psychological, aesthetic and social experience could be engaged and enriched.

2.3 Prototype of Self-Tracking APP with Avatar Template
A self-tracking APP prototype with an avatar template was designed and tested. Figure 1 illustrates screenshots and concepts of this prototype. (Fig.1)

Particularly for interaction systems to present the status of human bodies, the use of avatar complements the use of dashboards by conveying bodily experience, thereby “heightening perception and enriching creativity and meaning”. Although users’ presentation and reflection of their bodies in the form of avatars tend to be less objective than in the form of dashboards, it is exactly the subjective reflection of users that allows for creativity and meaning.

2.4 Stage 2: Emotional UX Research
The design research community has established theories and methods on how to design for pleasurable experiences and even how to evoke specific emotions through design, which also illustrates the relationship between positive emotions and users’ affirmative behaviours.

Clustering Emotion Words of Self-tracking Technologies
In the Stage Three, emotion words of self-tracking technologies had been clustered from fifty individuals (25 women) participated Stage One or Stage Two. These participants had been asked to choose emotion words which could represent their daily user experiments of self-tracking technology.
Figure 1. Prototype of Self-Tracking APP with Avatar Template

We borrowed 25 positive emotion words from Pieter M. A. Desmet[11] and 36 negative ones from Delft Institute of Positive Design[13]. The numbers of words participants choose were not limited.

Twelve emotion words most voted were clustered, as we name it “emotion words of self-tracking technologies v 1.0” and make a card-set. It contains six positive emotion words as Joy, Surprised, Amusement, Confidence, Anticipation and Satisfaction, and six negative emotion words as Doubt, Confusion, Anxiety, Annoyance, Frustration and Boredom. We further explained these twelve emotion words in context of using self-tracking application and implement an emotional UX research.

Participants
Fifteen individuals (8 women) participated. The sample’s mean age was 21 years (min. = 21, max. = 22), and were not repeated with those in the Stage One. The participants were students of the Internet and New Media Program at a university in Guangzhou, China. They received no compensation for their participation.

Procedure
Two prototypes of self-tracking APP were used for the emotional UX research -- one is the prototype with Avatar Template designed in the Stage Two, the other is a prototype with Dashboard Template, which combines interfaces and functions of Xiaomi Health APP, Huawei Health APP and Fitbit APP. The user research was emotion-focused. Participants were asked to use both these two prototypes and choose the emotion words from the card-set that could represent their emotion when using. They were all asked to use the Dashboard Template one first and finished the questions one to three following, and then use the Avatar Template one and answering questions one, two and four. This guarantees their emotion on the Dashboard Template had not been influenced:

1. Please choose some emotion words that can represent your emotion when using this prototype from the card-set. The number of words is not limited.
2. Please sort the emotion words you chose base on strong and weak difference of your emotion.
3. In this dashboard-based-prototype, please choose some emotion words that can represent your emotion when using the home-page/ the share-page/ the friend-page from the card-set. The number of words is not limited.

4. In this avatar-based-prototype, please choose some emotion words that can represent your emotion when using the home-page/ the share-page/ the friend-page/ the customized-avatar-page from the card-set. The number of words is not limited.

The question four and five interactions users valued most in such APP had been clustered

● Results and Reflection of Question 1 and 2

The Emotion Value of the APP were calculated based on the formulas following:

\[
\text{Emotion Value of the APP} = \frac{10}{n} \times (n - m + 1) + f
\]

where:
- \( n \): total number of emotion words participants chose
- \( m \): ranking of an emotion word by participants
- \( f \): the total number of participants

The total positive Emotion Value of the prototype base on dashboard template is 13.14, the total negative Emotion Value is 8.92; when the total positive Emotion Value of avatar template is 18.96, and the negative Emotion Value is 3.58. From these comparisons we can draw a conclusion that the Avatar Template-based APP arose more positive emotion and less negative emotion from users.

● Results and Reflection of Question 3 and 4

We choose seven major interaction pages from both the two prototypes base on three needs of users mentioned before. Three interaction pages of the dashboard-based prototype are 1) the home-page, 2) the share-page, 3) the friend-page. Four interaction pages of the avatar-based prototype are 1) the home-page, 2) the share-page, 3) the friend-page, 4) the customized-avatar page.

The results are presented in Table 1.

| Emotion     | p value   |
|-------------|-----------|
| Joy         | 0.009**   |
| Surprised   | 0.000***  |
| Amusement   | 0.000***  |
| Confidence  | 0.139     |
| Anticipation| 0.001**   |
| Satisfaction| 0.451     |
| Doubt       | 0.002**   |
| Confusion   | 0.770     |
| Anxiety     | 0.002**   |
| Annoyance   | 0.018*    |
| Frustration | 0.027**   |
| Boredom     | 0.001**   |

Table 1 Reflects of the results of chi-squared tests. 9 emotions as joy, surprised, amusement, anticipation, doubt, anxiety, annoyance, frustration and boredom are significantly different when using these two different interaction designs of self-tracking visualization.

3. CONCLUSION

This paper develops an interaction design based on Avatar Template of self-tracking applications, and further demonstrates that avatar design could arose positive emotions from users and promote their willing to adopt and sustain use through results of the emotional user research and questionnaire surveys.
By the results of this paper, we can now summarize two implications for principles of a sustainable interaction design of self-tracking applications.

- **Understandability:** the principle of simplifying complex dashboard of self-tracking through avatar template.

  We propose that the application providers should enable users to understand, appropriately trust, and effectively manage the products they are using. The designers and providers should develop interactions and systems which simplify the complex data collected, and have the ability to explain their rationale, characterize the strengths and weaknesses of a user’s health, and convey an understanding of how they will behave in the products. The strategy for achieving that goal is to develop an avatar template or new modified interactions that will produce more understandable data.

- **Performance optimization:** the principle of self-tracking technologies to understand the wider social and cultural context.

  We suggest that since the use of self-tracking technologies are activities for every day and for social, both researchers and designers should gain more insights into the design principles to develop related technologies and build applications that consider individual users’ psychological, aesthetic, cultural, and social preferences.

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