

# **A study on the effects of the usability of products on user's emotions - with emphasis on an extraction of user's representative emotions expressed while using products**

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## **Abstract**

Contemporary emotion-related researches have focused mainly on the relationship between product aesthetics and the emotional responses elicited by the products, but little is known about emotions elicited from using the products. The main objective of our research is analyzing user's emotional changes while using a product, to reveal the influence of usability on human emotions. Before proceeding into the main research, in this study we extracted user's representative emotions expressed from the product's use keeping aside the product's appearance.

We have extracted some emotional words that can come up during user interaction with a product and reveal emotional changes. Firstly, we assembled a set of emotional words that were sufficient to represent a general overview of Korean emotions, collected from various literature studies in the field of psychology, linguistics, emotional engineering. Secondly, we found emotional words from collecting the user opinion on the website. Finally the emotional words were collected from verbal protocols by using Think Aloud technique. The collected words were applied on evaluation survey twice for evaluating their appropriateness. Finally, we extracted 88 emotional words for measuring user's emotions expressed while using products. And we categorized the 88 words to form 6 groups by using factor analysis. The 6 categories that were extracted as a result of this study were found to be user's representative emotions expressed while using products.

It is expected that emotional words and user's representative emotions extracted in this study will be used as subjective evaluation data that is required to measure user's emotional changes while using a product.

## **1 Introduction**

With the advent of computer technology, the fundamental nature of products has shaped from physical forms towards product interactivity. The focus is now on usability of the product rather than conversing with just the looks of the product. That is, usability that concerns the ease and efficiency of use has become the key factor of success rather than its appearance (Shackel, 1991). However, most definitions of usability and contemporary usability-related researches, have focused on the performance-oriented functional aspects of usability (i.e., how well users perform tasks using a product). Today, user expectations are higher; products that bring not only functional benefits but also emotional satisfaction.

So far, there have been many studies on human emotions and the emotional side of products in the field of emotional engineering. Contemporary emotion-related researches have focused mainly on

the relationship between product aesthetics and the emotional responses elicited by the products. The researches on emotion and product usability merely show that human emotion affects product usability. In relation, Donald A. Norman (2002) claimed that negative emotions can make a simple task difficult, and that positive emotions can make a difficult task easier. However, little is known about emotions elicited from using the products and how the usability of products has effects on human emotions. Does good usability of products elicit positive emotions? On the other hand, does bad usability of products elicit negative emotions? These questions have not been clearly answered yet.

The main objective of our research is analyzing user's emotional changes while using a product, to reveal the influence of usability on human emotions. Before proceeding into the main research, in this study we extracted user's representative emotions expressed from the product's use keeping aside the product's appearance.

## **2 Extraction of emotional words**

In the field of emotional engineering, a measurement method that indirectly measures the user's emotions through adjectives, called emotional words, is used. However, most of the studies on emotional words are related to expressions of emotions felt from a product's appearance or studies on words that emotionally express a product's appearance itself. In relation, we have extracted some emotional words that can come up while people use a product and reveal emotional changes. First, we assembled a set of emotions that were sufficiently extensive to represent a general overview of the full repertoire of Korean emotions from various literature studies. Secondly, we found emotional words from the afternotes written by website. Lastly, emotional words were collected from verbal protocols in which the user says out loud what he/she is feeling while he/she is carrying out a task. After the collected words were deleted or integrated according to standards, they were applied on appropriateness evaluation surveys for identification of emotional expressions while using a product.

### **2.1 Extractions from previous research results and literature study**

Researches on emotional words have been carried out actively in the fields of psychology, linguistics, emotional engineering, and etc. The following are some of the major research results. Kim et al. (1998) analyzed the human inner system in the form of 'pleasant/unpleasant' through emotion related word analysis. Through free associations, 83 human inner system words were selected from emotion related words that were frequently used when expressing experience, and were analyzed through dimensional evaluation. Kim (2003) organized the linguistic characteristics of Korean emotional expressions through an overall examination on the characteristics of body language, and on the concept and category of emotion revealed from idioms. Idiom cases related to 'joy/happiness, sadness, anger, fear, love, and disgust/hate' were studied to examine the core meanings of each emotion. Jang and Jang (1994) categorized idioms of Korean emotion expressions into ones that reveal emotional experiences concerning the production, extinction, and continuation of emotions, and one that reveal emotion expression behaviors. 220 emotional idioms were suggested to set the category of emotions. Park et al. (1998) analyzed the overall meaning structure of Korean adjectives by using the semantic differential method. After 46 representative nouns that fall under Korean category criterion were suggested, the associated adjectives and Yonsei university Korean dictionary editors used the Korean vocabulary frequency list to collect adjectives. 115 frequently used adjectives in relation to various concepts were extracted and a group of graduate students majoring psychology extracted 40 set of main opposite word sets in Korean adjectives. Kim et al. (1993) collected adjective words that were used to express products.

Applicable adjective were collected from the Korean dictionary and 265 emotional words were extracted through appropriateness evaluation survey of understanding human emotions. Out of the adjectives extracted, 40 main words excluding opposite words and similar words were organized. The 40 emotional words evaluated by scaling method were categorized into attractiveness, luxury, comfort, openness, pleasantness, intimate, and feel of use through factor analysis. Han et al. (1998) used existing research results, reference literature, association methods on product advertisements, observations on a product's interface factor groups to extract 1,700 emotional words that are related to human emotions. These words were filtered according to overlapping meanings and elimination standards to come up with 163 final emotional words.

In our research, we collected 182 words by relating to these existing research results and literature studies. Psychological research result on emotional words by Kim et al. (1998) was set as the basis and other researches were added on to it. Words that clearly did not induce from the use of the product and that were induced simply from the appearance of a product was eliminated. Also, words that were derived from one word and words of similar concepts were combined in to one word group.

## 2.2 Extractions from product use afternotes on the website

From the afternotes, we can indirectly understand the psychological state, reactions, and opinions of users while they used the product. With the internet, we can access large numbers of afternotes from various websites. In this research, we used websites that are used by many users, such as shopping mall and mania sites, to extract emotional words from their afternotes.

- *Shopping mall sites: 6 sites*
  - *Daum shopping* (<http://dnshop.daum.net/>)
  - *INTERPARK* (<http://www.interpark.com/malls/>)
  - *Auction* (<http://www.auction.co.kr/>)
  - *CJmall* ([http://www.cjmall.com/index\\_tab1.jsp](http://www.cjmall.com/index_tab1.jsp))
  - *Buynjoy* (<http://www.buynjoy.com/>)
  - *Hansol CS Club* (<http://www.csclub.com/>)
- *Mania sites: 5sites*
  - *Cetizen.com* (<http://www.cetizen.com/>)
  - *dcinside* (<http://www.dcinside.com/>)
  - *nbinside* (<http://nbinside.com/>)
  - *Clien* (<http://www.clien.net/>)
  - *K-BENCH* (<http://www.kbench.com/>)

A total of 247 emotional words were collected from 11 websites on mobile phones, camera/digital cameras, home appliances, electronic pocket books, computer peripherals, and softwares. The emotional words collected from each websites were eliminated and combined according to overlaps and similarities.

## 2.3 Extractions from Think Aloud method in experiments

The two methods above are indirect methods of extracting emotional words. Think Aloud methods was applied as a direct method to collect emotional changes expressed by users while they used a product. Users were asked to perform a set of tasks using a mobile phone (J-PHONE) and verbally express their emotion during use. The participant users were 8 graduate students (4 males, 4 females) who have never used the experimented mobile phone (See Figure 1).



**Figure 1:** Extractions from Think Aloud method in experiments

It took an average of 20 minutes for the 8 participants to perform 5 tasks, and a total of 85 emotional words, including overlapping words, were extracted. A total of 53 emotional words were collected after the elimination of overlapping words. From debriefs after the experiment, we found that the Think Aloud method was not easy because the users concentrated on performing the given tasks due to the pressure of having to complete the tasks.

## **2.4 Assortment results of emotional words that are expressed during product use**

In this research, a total of 482 emotional words were collected from the following methods: 182 words from existing research results, 247 words from users' afternotes on websites, and 53 words from the Think Aloud method. After eliminating words with overlapping concepts, 363 words were used in appropriateness evaluation surveys to understand the emotions that can be expressed while using a product.

Through the first appropriateness evaluation survey on graduate students who study user interface and workers in the field of interface related work, we eliminated words that did not clearly relate to the use of a product, words that were derived simply from the product's appearance, and words that were not clearly understandable. A total of 34 users participated in the web survey. 18 users were male and 16 users were female. 18 users were in their 20s, 14 users were in their 30s, and 2 users did not mention their age.

From the survey, there were 39 words that none of the 34 participants chose, such as frustrated, disappointed, satisfied, delighted, and etc. By analogy, these words can be understood as appropriate words to express the emotions felt while using a product. In this survey, based on the average word selection frequency (average 3.887, standard deviation 4.219), the words that were selected by over 4 users were firstly eliminated. According to this, 231 emotional words were finally chosen out of the 363 words that were surveyed.

The selected words were applied on the second evaluation survey for evaluating their appropriateness. This survey was conducted for identification of emotional expressions while using a product. Finally, we extracted 88 emotional words for measuring user's emotions expressed while using products. And we categorized the 88 words to form 6 groups by using factor analysis. The 6 categories that were extracted as a result of this study, such as aesthetics, satisfaction in usability, novelty, uncomfotableness, pleasure and excellence were found to be user's representative emotions expressed while using products.

### 3 Conclusion

In this research, we extracted the emotional words and user's representative emotions that are expressed from the use of a product and not its appearance. It is expected that emotional words and user's representative emotions extracted in this study will be used as subjective evaluation data that is required to measure user's emotional changes while using a product. It will reveal the influence of usability on user's emotions through further experiments. We will measure user's actual emotional changes while they are using products by examining various physiological signs, such as electrocardiogram(ECG), electrodermal activity(EDA), electromyogram(EMG), blood pressure, pulse, and skin temperature. After each experiment, a subjective evaluation on the emotional changes expressed by the user is performed by the user him/herself using the emotional words extracted from the above study. We aim to evaluate the satisfaction level of usability of the product and compare it with the actual experiment results. Also, through continuous studies based on these researches, we hope to supply a basic framework for the development of interface with consideration to the user's emotions.

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