A PROPOSAL FOR MEASURING USER'S KANSEI

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ABSTRACT

Product design that provides aesthetic appeal and pleasure can greatly influence the success of a product. To create pleasant and good design, the designer has to balance between objective and subjective properties of a product, between usability and emotional expressiveness, between information and inspiration. User's Kansei is one of the most important tools to create pleasant products. The terminology of Kansei is imbedded in Japanese culture. It allows us to pay attention to the behavior and responses of people before, while and after their interaction with the products. The main objective of this study is to show and discuss a new method for interpreting and measuring user's Kansei before and while using a product. To achieve this aim, an experiment was carried out with 12 healthy people (in ages ranging from 20 to 28 years old) at a laboratory in Kyushu University. A coffee- maker is selected as case study. In the experiment, the authors focused on measuring and analyzing three elements: a) internal emotional and physical responses, b) user's facial cue, and c) words "spoken". The following tools were used to measure the above three elements respectively; Kansei sheet, digital camera, and user interview. Kansei sheet is a new tool proposed and used in the experiment in order to convey Kansei information regarding the visual appearance of a product and its usability to a designer. It is used for measuring qualitative and quantitative components that all emotions (including positive and negative) have. This study demonstrates the followings: 1) While there are many tools to measure emotions, most of them have limitations as they can be difficult to use and costly, and most require specific skills and additional evaluation time. Kansei sheet is an effective tool to understand user's emotions clearly and without losing much time, effort and money. Furthermore, users with different abilities can use and understand it easily, without any help. 2) In some cases, the outward facial and body expressions of a user are different from his/her true internal emotional responses while using a product. The new proposal enables a designer to interpret and measure user's kansei precisely and easily. 3) Measuring emotions that are evoked by interacting with the products is not only important for discovering which

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particular emotions are evoked by a set of stimuli but also for understanding why those stimuli evoke these particular emotions. In developing new products, this data is used to make decisions on the properties of a new design.

Keywords: emotion, user's Kansei, design tool, product design

1. INTRODUCTION

Kansei is well known and successful in the Japanese industry. It is imbedded in Japanese culture and used as fundament for an academic field and of a creative industrial activity [1]. The authors examined the interpretations of Kansei from many standpoints. Based on the literature survey, we defined Kansei as "the psycho- physiological impressions, opinions, consequences and reaction's that emerge when a person is exposed to external stimuli". In the Kansei process, human senses (sight, hearing, taste, smell, touch) and emotions, feelings, sensitivity, intuition are gathered. And probably user's Kansei is influenced by other internal tools (such as, personality, mood, experience and so on) [2].

In order to create a pleasant product, it is important to interpret and understand user's Kansei, including his/her emotional and physical responses and words (spoken). The results of the literature survey revealed that effective methods for measuring the actual emotional state(s) of users during their interaction with a product are limited [3]. The authors proposed a new design tool "Kansei sheets" for measuring and comprehending emotional and physical responses of a user before and while using a product. Our measurement tool provides interactive designers and researchers with valuable information about a user easily and precisely. This paper aims at illustrating how a designer can examine user's Kansei to improve subjective and objective properties of a new product. Furthermore, we test the new tool to be sure of its effectiveness.

2. METHODS

2.1. Kansei Sheet

Kansei sheets are visual measurement tools (Figures 1 and 2). They are easy to understand and use, regardless of the user's language skill or knowledge. These sheets aim to know and measure user's emotional and physical responses before and during his/her interaction with a product. The results of the literature survey revealed that the emotional responses are: positive, negative and neutral "there is no change in both emotional and physical states". We selected "happiness" to represent the positive emotion [4]. On the other hand, we found that the most common negative emotional responses are; anger, depressing "sad", surprise, fear, shame, and annoyance [5]. The most common physical responses are; a rapid heartbeat, hot body, cold body, headache, sweat, dizziness, difficulty breathing and body pain [6].

In these sheets, each case of user's emotional responses has three degrees for measuring it as follows: I feel this to some extent "20% - Little", I feel this "60% - Mid", and I strongly feel this "100% - High". Also each case of user's physical responses has three degrees for measuring it as follows: I complain somewhat of this "20% - Little", I complain of this "60%-Mid" and I strongly complain of this "100% - High". In the future work, the Kansei sheets will include five positive emotional responses as follows: attraction, satisfaction, surprise (positive), wish and joyful. On the other hand, they will have four degrees for measuring user's Kansei precisely.



Figure 1: Measuring Users' Emotional Responses



Figure 2: Measuring Users' Physical Responses

Kansei Sheets allow a designer to recognize in all emotional and physical responses two differentiated components; qualitative and quantitative. The first component is regarding the identification of the emotional (happiness, anger, etc.) and physical (sweat, headache, etc.) signatures. On the other hand, the second component is regarding the degree of each emotional and physical signatures (such as; little, mid, high).

2.2. Procedures of the experiment

The experiment aims to show how a designer can interpret and measure user's Kansei. It was conducted with 12 healthy people (6 men and 6 women- in ages ranging from 20 to 28 years old) at a laboratory in Kyushu University. A coffee-maker was selected as a case study. Seven participants are Japanese and the other five participants are foreigners (Europeans). All of them have never used a coffee maker. In this experiment, the authors examined two features: usability and a visual appearance of a coffee-maker. Each participant was asked to perform three tasks: First one is regarding aesthetics appeal of a product— "Q.1 Is this design of a coffee- maker pleasant for you?" Second and third tasks are concerning product usability— "Q.2 Would you set up this coffee-maker?", and "Q.3 Would you make a cup of coffee?" Three different elements were measured for understanding and identifying user's Kansei: a) internal emotional and physical responses, b) facial cue, and c) words. The following tools and methods were used to measure each element respectively; Kansei sheets,

digital camera, and user interview. We recorded the times that were spent to carry out the last two tasks. And the authors analyzed the collected data of each task.

3. RESULTS AND DISCUSSIONS

Human beings are creatures of emotion and emotion plays a pivotal role in our daily lives. Emotion aids us in assessing our circumstances and to make judgments, good or bad, dangerous or safe, etc. There is no simple or universally accepted definition for what emotion is. Sloman [8] defines emotions as "cognitive processes hence resulting in a specific outcome when faced with the products or the services". Cognition interprets and leads us to better understanding in order for us to make valuable judgments for better survival [9].

Nowadays, there are few techniques and methodologies for gathering affective data without asking the users what and how they feel after their interaction with a product. We can give computers affective perceptual abilities and measure physiological and behavioral signals such as, for example, body-worn accelerometers. We can also evaluate user's eye gaze and collect electrocardiography (EKG), electroencephalography (EEG) and electromyography (EMG) data, blood volume pulse, heart rate or respiration and, more recently facial recognition software [3]. However, most of the above techniques and others (such as; a questionnaire, card sorting, etc.) have limitations as they can be difficult to use and costly, also requiring specific skills and additional evaluation time. Furthermore, many of them cannot be used for measuring Kansei information while using a product. Kansei sheets are proposed to save the designer's time, effort and money.

3.1. Kansei sheets

a) Aesthetic appeal and user's Kansei (test 1)

Design for emotion is when a product is created to fulfill an emotional need or desire. It recognizes the human side of us in a very concrete way. We have a lot of products we don't like or feel very negligent or uninspired about, and that is a big problem [10]. Despite years of usability research, many products do not seem desirable for people. The design of many electric products with high functionality fails to realize successful marriage with the enjoyable user experience.



Figure 3: The Coffee-Maker

In the experiment, the participants were first asked about their feelings regarding the visual appearance of the coffee maker, "is this design of a coffee-maker pleasant for you?" (Figure 3). We gave each person the "sheet 1" to select his/her feeling while looking at and touching a coffee-maker. The results of the first test revealed the followings (Figure 4): 66% of the participants selected "negative emotions", such as; annoyance and depressing. On the other hand, 17% of the participants chose "positive emotions" and 17% of them selected "neutral".





Figure 5: Evaluations of Users' Kansei

The results of this test revealed that a coffee maker design (regarding its form, size, material and color) is less pleasant for foreigners than Japanese participants (Figure 5). In other words, visual appearance of a product is more acceptable among Japanese participants than Europeans.

b) Usability and User's Kansei (tests 2 and 3)

In this stage, we asked each user two questions: Q. 1) Would you set up a product? And Q. 2) Would you make a cup of coffee? We gave each participant the Kansei sheets to identify and measure his/her emotional and physical responses during his/her interaction with a coffee maker. The intention is to see how product usability can impact on the user's kansei. The results of the first question (test 2) are as follows (Figure 6): 83% of the participants chose "negative

emotions" while setting up a product. Many of them think that this coffee maker has some useless pieces (such as, a mixer), and these pieces are hard to collect. In contrast, 17% of the participants selected "positive emotion". As for the physical responses, about 50% of the participants complained of a little rapid heartbeat (Figure 7). And 44% of them complained of other symptoms, such as; slightly headache, sweat and cold hand. 16% of the participants had no any physical symptoms (Neutral). The results of the test showed that Kansei of Japanese participants (emotional responses) is higher than Kansei of European participants (Figure 8).



Concerning the results of the second question (test 3), all the participants' emotional responses were negative during their interaction with a coffee maker (Figure 9). About 42% of the participants felt shame and 33% of them felt angry, as they were confused about how to use a product. Furthermore, 16% of the participants were annoyed during the task and 9% of them were depressed "sad". As for the physical responses of the participants while doing the task, we found that 25% of them complained of a little sweat and 25% of them complained of rapid heartbeats (Figure 10). About 25% of the participants had no physical symptom (neutral), and 17% of them complained of hot body (cheek and hand for example). About 8% of the participants had a little headache. The result of this test showed that kansei of Japanese participants is higher than kansei of European participants while facing the usability problems (Figure 11). This might be due to cultural differences.

3.2. Facial Cue

This method is selected to measure users' dynamic expressions by observing them during their interaction with the coffee maker. A digital camera was used for the same aim. Nowadays there are software applications that automatically capture facial expressions and eye gaze which provide key information to the designer. However, these techniques are difficult and take a long time [11-12]. Facial coding offers a chance to tap into users' intuitive, often subconscious emotional responses. It originated with Charles Darwin, and is based on three facts [13]:













Figure 11: Evaluations of Users' Kansei "Test 3"

1) the face is the only place in the body where the muscles attack right to the skin, hence great spontaneity; 2) humans have more facial muscles than any other species on the planet, hence the wealth of data; 3) even a person born blind has the same facial expressions, hence the method's universality across cultures (despite display rules that do vary some but it's the

same muscle movements that correspond to the same emotions, only the intensity and duration of the display will vary across cultures). In the experiment, we measured and evaluated the participants' facial expressions according to the ten emotion heuristics (TEH) [3]. The heuristics are based on two theories that relate expressive reactions to distinct emotions. First one is based on the Facial Action Coding System (FACS) [14], currently a well-known standard to systematically categorize the physical expression of emotions. The Maximally Discriminative Facial Moving Coding System (MAX) [15] is the second theory that links expression features to specific emotions. In test 3, we selected six participants as examples to analyze their facial expressions based on the THE (Figure 12).

User (1) is a Japanese male. He moved his mouth during his interaction with a product. Based on the TEH, mouth gesturing is associated with a sign of being lost and of uncertainty. User (2) is a Japanese female. We found that her hand was touching her face during the interaction with a product. Based on the TEH, elevating the hand that is placed on the mouth to her face is a sign of confusion and uncertainty, generally a sign of the user being lost or tired. User (4) is a Japanese female. Her face was frowning during the interaction with a coffee maker. Based on the TEH, frowning can be a sign of necessity to concentrate or displeasure. Frowning is one of the signs of deep and "perplexed reflection" [16]. User (10) is a European male. We noticed that his face was smiling during the interaction with a coffee maker. According to the TEH, a smile, or elevation of the cheeks, is a sign of satisfaction. The user may have encountered an element of pleasure during the task. Smiling activity is significantly higher during the positive condition [17]. User (11) is a European female. Her hand was touching her face during the interaction with a product. This is a sign of being tired based on the TEH. User (12) is a European male. His face was frowning during the interaction with a product. This is a sign of concentration.

The results of the former two methods (Kansei sheets and facial cue) revealed that a designer often evaluates the users' emotional responses from their outward facial and body expressions. However, in some cases these outward physical responses can be somewhat misread or misunderstood. The reason is that obvious facial and body expressions of the users don't always precisely reflect their true internal emotional responses. In other words, we realized that our interpretations of the facial cues of some participants are different from their true emotional responses. For example, user (4), the result of the Kansei sheet shows that a user felt angry (negative emotion) while using a coffee maker. However her facial cue gave us a sign of concentration (neutral emotion). Another case, user (10) felt a shame (negative emotion) while interacting with a product. The reason is that he could not achieve the task perfectly in time. However, his facial cue gave us a sign of happiness (positive emotion). From this, it can be said that Kansei sheets are essential to interpret and measure user's emotional and physical responses precisely. Next part is important for discussing the reasons behind the users' problems and also identifying their opinions on usability and visual appearance of a coffee maker.

3.3. Words

In the experiment, each user was asked about his/her needs, experiences and opinions on the coffee maker, regarding its appearance and usability (Table 1). The most important comments we got from the users regarding the coffee maker's appearance are: unattractive form and unpleasant color. People want a product that attracts their attention and gives them pleasure. Concerning product's usability, the followings are the most important problems the participants faced during their interaction with the coffee maker: unclear icons, lack of information and instructions. In addition, some instructions are not understandable, as they are written in Japanese. People want a product that enables them to achieve their goal easily and quickly.



Smiling "Satisfaction"

Hand touching the face "Tired" Frowning "Concentrate"

Figure 12: Usability and Users' Kansei (Test 3) - Facial Cue "Users 1, 2, 4, 10, 11 and 12"

The results of the former three methods help us to understand and measure the users' Kansei. In addition, the main problems of the coffee maker design are identified. Overall, this study emphasis on the importance of knowing about emotions and feelings because marketing is becoming more emotional. Furthermore, emotions elicit decision making and behavior. It's not that difficult to understand how we design to appeal to the senses. How things/products look, how they feel, how they are smell, taste, and sound. It's not that difficult to understand behavior to the intellect. Do I want it? Will it be useful? And so on. But what about designing to appeal to the emotional being? Does it "move" me? Is it joyous? All are harder to describe and to measure objectively. But all the same, when we "feel" it, we know it's there.

User	Gender	Nationality	Usability Problems	Aesthetics Problems
1	Male	Japanese	Unclear Icons/ Hidden ice sign	Unattractive form
2	Female	Japanese	Water bottle is difficult to use	Unpleasant color
3	Female	Japanese	Unclear hot and ice instructions	Unpleasant color
4	Female	Japanese	Setting up a product is difficult	Big size
5	Male	Japanese	Not enough instructions	
6	Female	Foreigner	lce signs are not understandable	Material looks cheap
7	Female	Foreigner	Too many words in Japanese	Big size
8	Male	Japanese	No sign for the water amount	
9	Male	Japanese	Not enough information	Not kind and attractive
10	Male	Foreigner	Many icons are not helpful/needed	Form has many lines
11	Female	Foreigner	Figuring out the water bottle is	Color and form are not
			unclear	friendly
12	Male	Foreigner	Too many icons	Unpleasant form

Table 1: Usability and Aesthetics' Problems from the Participants' perspectives

4. CONCLUSIONS

Emotional appeal is a key dimension in user experience that often goes unmeasured in many user-centered design projects. The present study aims at illustrating how to measure users' kansei in the design process. For this aim, different effective methods are used and suggested. Furthermore, the authors proposed and used a new measurement tool for interpreting emotional and physical responses of a user before and while using a product precisely. Our proposal allows a designer to measure both qualitative and quantitative components that all emotions (including positive and negative) have. It is easy to use and understand, without losing much time, effort and money. Furthermore, Kansei sheets can be used in the real site and environment as well. In summary, this study puts emphasis on understanding people's practical needs, emotions, hopes, and aspirations for creating pleasant products. It is essential to know how people want to feel about themselves and the role that the products that they use can play in this.

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