

論文 / 著書情報
Article / Book Information

論題(和文)	
Title	Factors that Elicit Human Affects: Affective Responses among Japanese Adults
著者(和文)	唐 欽, 梅室 博行
Authors	Qin Tang, Hiroyuki Umemuro
出典 / Citation	, Vol. 62, No. 6, pp. 311-322
Citation(English)	Journal of Japan Industrial Management Association, Vol. 62, No. 6, pp. 311-322
発行日 / Pub. date	2012, 2
Note rights	日本経営工学会
relation	isVersionOf: http://ci.nii.ac.jp/naid/110009419678

Factors that Elicit Human Affects: Affective Responses among Japanese Adults

Qin TANG ^{†1} and Hiroyuki UMEMURO ^{†1}

Abstract: Demand is growing for design of services and products that provide affective experiences. Recent studies have indicated people tend to enjoy services or products that can engender affects (emotions, moods and feelings). A number of studies have investigated the relationships between design parameters and human affects, while some others were concerned with how to design affect-eliciting services and products. However, few studies have specifically examined what the essential elements that elicit human affects may be. The purpose of this study is to therefore find general factors contributing to the generation of human affects. First, free narrative descriptions about things or experiences that could elicit affects are collected from participants and analyzed to extract the elements contributing to the generation of human affects. Second, a questionnaire-based investigation was conducted to validate the elements extracted. Factor analysis was employed to investigate the factor structure of the extracted elements. Results showed that the extracted affective elements could be grouped into eight factors, named “affective factors.” Meanwhile, the relationship between affect and affective factors was validated using correlation analysis. The results of this study suggest possible ways to elicit human affects while also serving as a reference tool for designers of products and services.

Key words: affect, design, service, product, experience, reflection

1 INTRODUCTION

Since the late twentieth century, enterprises have sought usability, functionality and quality to help consolidate or enhance any advantage they may have over their competitors. However, decades of such efforts by industries have resulted in products and services so functional that they serve their users quite well, leaving few defects to be subsequently removed. Consequently, usability itself, functionality or quality by itself is no longer sufficient to make a product or service attractive and distinguishable from those of competitors [1]. The value created by investing solely in such aspects has reached a ceiling. Hence, the creation of new value for products and services that delight users beyond these conventional aspects has become a new and difficult challenge for researchers in various domains.

To design products and services that customers themselves want to use and keep using, researchers

now focus on eliciting customers’ *affects*, that is, to provide them with *affective experiences*. In the psychology domain, the term *affect* represents not only human emotions but also moods and feelings. In this paper, *affective* is defined as “being capable to evoke affects in people’s minds” or “being capable to deliberate affects to be evoked in people’s minds” [2]. Early in the 1990s, Fulton [3] introduced “pleasure” as an aspect of human factor approaches. Later, Norman [4] emphasized the importance of considering user emotions when designing products. In addition, previous studies have indicated the importance of technology and services which can provide affective experiences [2],[5]. Moreover, an interdisciplinary field called *funology* [6] has also emerged in recent years. Funology concerns a series of issues related to fun, enjoyment, aesthetics and experience of use. Along with theoretical discussions, researchers have also proposed methodologies for designing affect-eliciting products [7]-[10], while others have partially validated the relationships between design parameters and human affects [11]-[13]. Likewise, how to incorporate human affects into service design has also

^{†1}Tokyo Institute of Technology

Received: May 16, 2010

Accepted: December 1, 2011

attracted the attention of researchers [14]-[16].

The emphasis placed on the importance of evoking customer affects is not confined to a single research field. Being aware of changes in customer needs, researchers in the field of quality management regard incorporating customer affects into the product design process as a critical issue [17]. Furthermore, Pine and Gilmore's [18] research has revealed that providing customers with distinctive experiences can enhance the economic value of enterprises. Subsequently, new concepts, such as *experiential marketing* [19],[20], as well as frameworks and methodologies have been proposed in the marketing and retailing field to elucidate the unique experiences of customers [21] and detect what drives the formation of such experiences [22],[23]. In addition to theoretical approaches, case studies have also been conducted to examine the role of experiential features in several well-known products [24].

Though the importance of eliciting customer affects is now understood, still only a few studies have clarified the elements contributing to the generation of human affects. Without knowledge of such elements, it is difficult to holistically illustrate any affective experiences provided by products or services. This may also explain why approaches to the design of affect-eliciting products and services remain implicit.

Figure 1 shows a model of the relationship between the potential elements that may cause people's affects, and affects elicited in users as a result of their experience of the affect-eliciting products or services. These possible elements are believed to contribute to the generation of users' affects. In this study, these elements are referred to as *affective elements* hereafter. In this study, according to the model, we first explored the potential elements contributing to the generation of human affects, and then validated how these elements might evoke users' affects.

As a related concept, it is worth mentioning the concept *Kansei*, which has attracted much research interest in Japan. Nagamachi [25] defined *Kansei* as a Japanese term with a broad interpretation, including sense, sensitivity, sensitiveness, sensibility and feeling, image, affection, emotion, want, as well as need. Meanwhile, Nagamachi also noted that the

term *Kansei* includes a wide range of meanings. On the other hand, *affect* is a phenomenon that can be observed either objectively or subjectively, and thus more appropriate as a target of scientific studies. Thus, in this study, we adopted the concept of *affect* as our specific research objective, instead of *Kansei*.

This study first extracted elements contributing to the generation of human affects based on free narrative descriptions written by participants about things and experiences that might elicit affects. A questionnaire-based investigation was then conducted to validate whether the elements extracted actually contributed to the elicitation of affects. The results provide useful information on how to elicit human affects to be used by the creators of value-added products or services.

2 EXTRACTION OF AFFECTIVE ELEMENTS

To extract elements that might elicit human affects, narrative descriptions of things and experiences were collected and analyzed. A series of surveys were conducted in the forms of both questionnaire and interview.

Twenty-five participants from China, 11 from Thai, 19 from Finnish and 26 from Japan participated in this survey. Participants were undergraduate and graduate students at Finnish, Japanese and Thai universities.

2.1 Method

The participants were first given an explanation of the purpose of the research. Then, the definitions of *affect* and *affective* were provided, noting

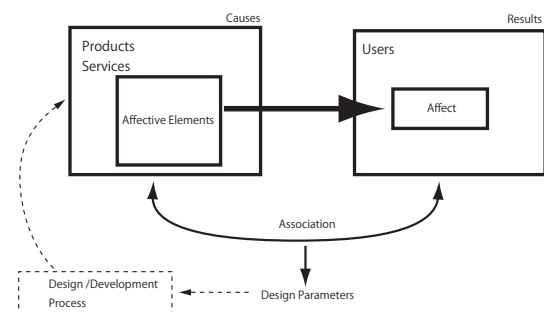


Fig. 1 Relationships between affective elements and human affects.

that the concept of affect includes both positive (e.g., “happy”) and negative (e.g., “sad”) aspects. These two examples were also used during the interview and questionnaire. Participants were then asked to provide their demographic information.

Next, they were asked to write down their answers to two questions in free-response form. The first question was (1) “Please raise things that give you any (either positive or negative) affective experience.” Participants were informed that their answers could include both intangible and tangible things. The second question was (2) “What kind of affect did these things give you, and why.”

Participants’ answers were checked to ensure no important points were missing. If there were any missing points in the interview, the participants were asked to add to their written descriptions. The quality of the narrative data were ensured through this step.

In total, 184 samples (i.e., the number of descriptions of affective things) were collected from 83 participants.

2.2 Results

The collected data were divided into three parts, (1) the things that caused affective experiences, (2) the kinds of affects evoked and (3) the reasons why such affects were evoked. All data were checked manually. Figure 2 shows the extraction of keywords from a sample of narrative descriptions.

Keywords that best represented the reasons why something was regarded as “affective” were selected and then keywords with similar semantic meanings were grouped together. For instance, “usability” was used to group keywords such as “easy to use (cell phone)” and “difficult to learn to use.”

In total, 43 keywords were extracted. These keywords were referred to as affective elements. The list of these affective elements is shown in Table 1.

Some of the 43 affective elements were found to have two polarities. For instance, “good quality” may result in a positive affect, while “bad quality” may lead to a negative affect. Such polarity does not appear in the other affective elements. For instance, while “considered to be new high-tech” may result in a positive affect, the lack of this affective element might not necessarily lead to the opposite

affect. The affective elements with dual polarities are indicated with asterisks in Table 1.

3 EXTRACTION AND VALIDATION OF AFFECTIVE FACTORS

3.1 Method

To confirm that the elements extracted in Section Two have the potential to evoke human affects, a questionnaire was administered.

3.1.1 Participants

Twenty-five participants, comprising graduate students, undergraduate students and university staff aged between 21 and 45 ($M = 24.24$, $SD = 4.50$) participated. All participants were Japanese.

3.1.2 Procedure

First, the participants were given an explanation of the purpose of the research and asked to read the instructions carefully. Next, they were asked to provide some background information. They were then asked to look at each of the stimulus pictures and read the statement beneath the picture (if any) carefully and then answer the questionnaire items corresponding to the picture. Participants were instructed not to assess the picture itself (e.g., the image quality or the composition) but the picture’s content. They were instructed to evaluate the stimulus pictures one by one and continue until all 14 stimulus pictures were evaluated.

3.1.3 Stimulus

Fourteen pictures were selected as stimuli to elicit participant affects. Dahan and Strinivasan [26] showed that high-resolution pictures can be used to elicit responses about products and yield reliable results comparable to the use of physical pro-

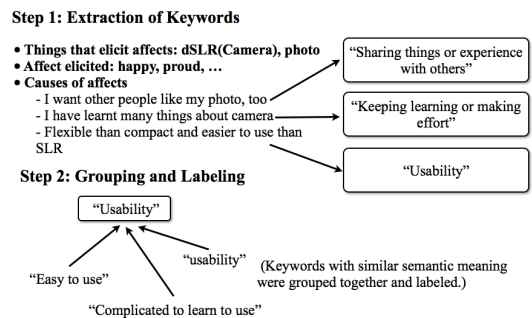


Fig. 2 Extraction of keywords from a sample of narrative descriptions.

totypes. On the other hand, for some affective elements, such as “feeling of belonging and acceptance” and “serenity and coziness,” the pictures by themselves were considered insufficient to elicit any

Table 1 Elements extracted from text analysis.

Functionality *
New high-tech
Quality *
Easy to use *
Satisfying physiological needs
Natural scenery
Comfortable sound, taste, touch or smell *
Risk or uncertainty of potential or present danger
Physically and mentally relaxing
Serenity and coziness
Possessing something unique or rare
Personalizing one’s own thing
Feeling of superiority
Connections with beloved people
Natural disaster
Bond with properties, family, hometown or homeland
Feeling of isolation or distance from others
Sharing things or experiences with others
Communication with others
Clear purpose in life
Supportive or encouraging people or things
Hobby, personal interest or intellectual activity
Good atmosphere and environmental condition
Thoughtful and deliberate persons or behavior *
Creativity by applying one’s skills or knowledge
Keep learning or making efforts
Achievement, success, reward for one’s effort
Feeling of belonging and acceptance
Taking a break from one’s daily routine
Sports
Arts
Moral standards *
Considerate persons or behaviors
Babies or cute animals/children
Absorption in activities
Design concepts *
Designs *
Materials *
Textures *
Aesthetic things *
Self-esteem (increasing/decreasing)*
Precious memories about people or things
Human touch

Note: items marked with a * have both good and bad polarities, e.g. good functionality and bad functionality.

affects in participants. Thus statements were added to some of the pictures. Initially 18 candidate pictures were selected based on two criteria: (1) The stimuli should be able to elicit participant affects; (2) the contents of the stimuli set should cover all 43 of the extracted affective elements. A pilot test using four participants was conducted and 14 stimuli were selected from the candidates. The results of the pilot test showed that all the selected stimuli could elicit at least 75% of participant affects and cover all 43 elements extracted.

3.1.4 Measurements

The first section of the questionnaire consisted of 55 questions. The 55 question items were designed based on 43 affective elements extracted. For affective elements with dual polarity, which are marked with asterisks in Table 1, both good and bad expressions were employed as items. For instance, for the “functionality” element, both “good functionality” and “bad functionality” were included in the questionnaire. Question items in Japanese language are shown in the Appendix. Participants were asked to rate to what extent each affective element matched the stimulus given using a five-point Likert-type scale (-2: not at all; 2: very much). The second section of the questionnaire examined the participants’ affects elicited by each stimulus. The two primary dimensions of human affect, known as *valence* and *arousal* [27], were used to measure the affects elicited in the participants. Valence can be described with a bipolar scale, such as pleasant states (e.g., love, joy) and unpleasant states (e.g., anger, sadness, fear). Arousal invokes a single axis of intensity, increasing from calmness to maximum arousal. Four statements were included in this section: “positive affect was caused”, “negative affect was caused,” “strong affect was caused” and “calm affect was caused.” For each statement, participants were asked to indicate to what extent each statement matched their affective status using a five-point Likert-type scale (“-2: strongly disagree with the statement” to “2: strongly agree with the statement”).

As affective elements proposed in Section 2 were all described in English, the questionnaire was initially designed in English accordingly. Then, the questionnaire was translated into Japanese for eas-

ier understanding and convenience of Japanese participants. Translation was conducted through the discussion of a group of international researchers including Japanese members. All members of the group are familiar with both Japanese and English languages to certain extents. Afterwards, initial translation was examined in a pilot test with nine Japanese participants. In the pilot test, all question items were verified as being easily understood, neither confusing nor misleading. In this study, as the same questionnaire in Japanese was used for all participants, any influence on the results due to variations of translation was considered to be avoided.

3.2 Results

3.2.1 Extraction of affective factors

To find the factor structure of the elements, participants' responses for the 55 questionnaire items were analyzed using factor analysis. The Principal Component Method and Varimax Rotation were employed. The number of factors extracted was determined by the eigenvalue before rotation. Only factors with eigenvalues greater than 1.0 were accepted. In total, eight factors were extracted from the 55 variables. The cumulative contribution for the eight factors was 54.0%. A Kaiser-Meyer-Olkin test, which measures sampling adequacy, was then performed to assess the appropriateness of using factor analysis on the data obtained. The result was 0.867, indicating that the factor analysis results were both acceptable and meaningful. Table 2 shows the factor matrix.

Variables such as good design, high quality, high functionality, good materials, good design concept, personalizing one's own thing, feeling of superiority, new high-tech, good texture, easy to use, possessing something unique or rare, good aesthetics, increasing of self-esteem and not easy to use showed high factor loadings on the first factor; thus the first factor was named "product satisfaction."

Variables with the highest factor loadings (greater than 0.70) on the second factor included: bond with properties or one's family, hometown or homeland; connections with beloved people; precious memories about people or things; feeling of belonging and acceptance; and communication

with others. In addition, variables such as sharing things or experiences with others, good atmosphere and environmental condition, supportive or encouraging people or things, clear purpose in life, natural scenery also loaded highly on the second factor. However, it is worth noting that variables related to human instinct, such as satisfying physiological needs, comfortable sound, taste, touch or smell, physically and mentally relaxing, serenity and coziness, taking a break from one's everyday routine and human touch (things that remind people of the warmth of humans) also presented strong relationships with this factor. Thus, the second factor was named "social connection."

Variables with negative meanings, such as poor functionality or quality, causes of human discomfort (uncomfortable sound, taste, touch or smell), risk or uncertainty of potential or present danger, feeling of isolation or distance from others, natural disaster, poor materials, bad aesthetics and decreased self-esteem had high factor loadings on the third factor. Thus, the third factor extracted was named "risk and unpleasant."

The fourth factor, comprising creativity by applying knowledge or skill; keep learning or making efforts; absorption in activities; hobby, personal interest or intellectual activity; arts; and achievement, success and reward for one's effort was named "challenge and activity," because most of the relevant variables are about "activities" in which a goal is set and one's skill, knowledge or concentration is critical to achieve the goal.

Variables with high factor loadings on the fifth factor were related to moral standards or ethical issues, including things for or against one's moral standards, considerate persons or behaviors, thoughtful and deliberate persons or behaviors, and thoughtless and indeliberate persons or behaviors. Thus, the sixth factor was named "ethics and morals."

Variables with higher factor loading on the sixth factor expressed poor appearance or bad taste, including poor design concept, poor design, and poor texture. Thus the sixth factor was named "poor design, style and appearance."

Variables with high factor loadings on the seventh factor included serenity and coziness, phys-

Table 2 Structure of affective factors.

Item	Fac.01	Fac.02	Fac.03	Fac.04	Fac.05	Fac.06	Fac.07	Fac.08
Good design	0.824							
High quality	0.812							
High functionality	0.785			0.337				
Good materials	0.778							
Good design concept	0.775							
Personalizing one's own things	0.769							
Feeling of superiority	0.763							
New high-tech	0.762							
Good texture	0.732							
Easy to use	0.730							
Possessing something unique or rare	0.722							
Good aesthetics	0.562							
Increases self-esteem	0.540							-0.348
Not easy to use	0.397							
Bond with properties or one's family, hometown or homeland		-0.805						
Connections with beloved people		-0.804						
Precious memories about people or things		-0.733						
Feeling of belonging and acceptance		-0.727						
Communication with others		-0.706						
Sharing things or experiences with others		-0.681		0.310				
Good atmosphere and environmental condition		-0.626					-0.330	
Human touch		-0.583			0.363			
Supportive or encouraging people or things		-0.579						
Comfortable sound, taste, touch or smell	0.390	-0.502					-0.319	
Satisfying physiological needs		-0.491						
Clear purpose in life		-0.471						
Natural scenery		-0.455						
Taking a break from one's daily routine		-0.332						-0.322
Natural disaster			0.688					
Uncomfortable sound, taste, touch or smell			0.681					
Poor quality			0.605					
Risk or uncertainty of potential or present danger			0.567					
Poor aesthetics			0.562					
Feeling of isolation or distance from others			0.535					
Poor materials			0.511			0.389		
Decreased self-esteem			0.483					
Poor functionality			0.374					
Creativity by applying knowledge or skill				0.760				
Keep learning or making efforts				0.684				
Absorption in activities				0.571				
Hobby, personal interest or intellectual activity	0.390			0.558				
Arts				0.535				
Achievement, success and reward for one's effort				0.509				-0.451
Aligned with moral standards					0.719			
Thoughtless and indeliberate persons or behaviors					0.708			
Thoughtful and deliberate persons or behaviors		-0.314			0.698			
Considerate persons or behaviors		-0.396			0.643			
Things against one's moral standards					0.604			
Poor design						0.791		
Poor design concepts						0.719		
Poor texture						0.465		
Serenity and coziness		-0.560					-0.607	
Physical and mental relax		-0.542					-0.585	
Babies or cute animals/children							-0.542	
Sports								-0.615

Note: Factor loadings with absolute values less than .3 are omitted.

ically and mentally relaxing, babies or cute animals/children, good atmosphere and environmental condition, and comfortable sound, taste, touch or smell. Hence, the seventh factor was named “healing and relax.”

Four variables showed comparatively high loadings on the eighth factor: “sports,” “achievement, success and reward of one’s effort,” “taking a break from one’s daily routine” and “increased of self-esteem.” All variables relates with sports and what could be derived from sportive activities. Thus, this factor was named “sports and achievement.”

3.2.2 Relations between affective factors and affects

To validate the extracted affective elements and affective factors, the factor scores of the eight factors were calculated for each sample, and then the correlations between the factor scores and the variables representing the affects of the participants were analyzed.

Table 3 shows the Pearson’s correlation coefficients for the four affect variables. A negative correlation between positive affect and negative affect was confirmed, while there was no significant correlation found between strong affect (high level of arousal) and calm affect (low level of arousal). Furthermore, positive affect showed a significant correlation with both strong affect and calm affect, while negative affect was only related to strong affect.

The correlation coefficients between affective factors and affect were then calculated. Table 4 shows the results of a correlation analysis between the factor scores and affect variables. Holistically, all affective factors showed significant correlations with either positive or negative affect, or with both. Except for the “product satisfaction” and “poor design and style” factors, all factors showed significant correlations with either strong or calm affect, or with both. This result thus validated our as-

sumption that the extracted factors contributed to the formation of affect.

As shown in Table 4, the “product satisfaction” factor (Fac. 1) showed a significant positive correlation with positive affect and a negative correlation with negative affect. These results suggest that products with good functionality, quality, usability and design can engender positive affects among their users. The “social connection” factor (Fac. 2) had significant strong relationships with both the valence and arousal dimensions of affect. This result suggests that the “social connection” factor is related to positive human affects while also being able to engender calm affects. The “risk and unpleasant” factor (Fac. 3) was also related to both the valence and arousal dimensions. It had a strong positive correlation with negative affect, but a negative correlation with positive affect. This factor also seemed to be related to both strong and calm affects, showing a positive correlation with strong affect, but a negative correlation with calm affect. The “creativity and challenge” factor (Fac. 4) showed significant correlations with both positive affect and strong affect. This result suggests a correlation between certain activities (sports, intellectual activities, etc.) and positive and strong affects. The “ethics and moral” factor (Fac. 5) showed significant correlations with negative affect and strong affect. The “poor design and style” factor (Fac. 6) had a significant correlation with negative affect but no significant correlation with the other three variables. The “healing and relax” factor (Fac. 7) had a significant relation to positive affect and calm affect. The “sports and achievement” factor (Fac. 8) showed a positive correlation with positive affect as well as a positive significant relation to strong affect.

3.2.3 Stimuli examples and their factor scores

Finally, 3 out of the 14 pictures used as stimuli were picked to show how affective factors illustrate the ways differences in factors can contribute to human affective experience. The mean values of the factor scores of the eight affective factors for each stimulus were plotted in cobweb charts in Figs. 1, 2 and 3.

Figure 3 shows stimulus A and its factor scores.

Table 3 Correlations among affect variables.

	Positive	Negative	Strong	Calm
Postive	1.000			
Negative	-0.286**	1.000		
Strong	0.273**	0.349**	1.000	
Calm	0.497**	-0.101	-0.016	1.000

** $p < .01$.

Table 4 Correlations between affect variables and factor scores of affective factors.

	Fac. 1	Fac. 2	Fac. 3	Fac. 4
Positive	0.320**	0.413**	-0.249**	0.147**
Negative	-0.186**	-0.176**	0.536**	-0.042
Strong	0.065	0.095	0.319**	0.211**
Calm	0.026	0.448**	-0.172**	-0.084
	Fac. 5	Fac. 6	Fac. 7	Fac. 8
Positive	-0.049	-0.015	0.212**	0.199**
Negative	0.219**	0.116*	-0.085	-0.052
Strong	0.132*	-0.017	-0.038	0.225**
Calm	-0.055	-0.009	0.464**	-0.055

** $p < .01$. * $p < .05$.

Stimulus A comprised a picture and short statement. The “social connection” and “healing and relax” factors had comparatively higher scores. The items “natural scenery” and “connection with beloved people” attributed to the generation of affect.

Figure 4 shows the picture used as stimulus B and its factor scores. The picture is of a Mercedes Benz automobile. Comparatively higher factor scores were observed in the “product satisfaction” factor as well as the “sports and achievement” factor. This result implies that a user’s affect can be elicited when the automobile satisfies a need for sportive activity or achievement.

Stimulus C, a picture of a cat, and its factor scores are shown in Figure 5. The “healing and relax” factor had the highest factor scores, which is in accordance with the factor analysis result that the item “cute animals” was included in the “healing and relax” factor.

4 DISCUSSIONS

4.1 Affective Factors and Affect Generation

In this study, the relationships between various affective factors and affect variables were validated; also, several intriguing facts were observed.

A significant negative correlation between positive and negative affect was confirmed. In terms of the arousal dimension, on the other hand, no significant correlation between strong and calm affect was observed. This result indicates that strong and calm affect are not two opposing statuses, as is commonly believed. It is also worth noting that negative affect was only correlated with strong affect.

Further research is necessary to confirm whether most of the recorded negative affective experiences were accompanied by strong affect.

Among the affective factors extracted, all showed correlations with affect, either in the valence or arousal dimension, or both, at a significance level of at least 5%. It is intriguing that both the “product satisfaction” (Fac. 1) and “poor design and style” (Fac. 5) factors did not correlate with the arousal dimension of affect. Further research is necessary to confirm the influences of these two factors on the arousal dimension of human affect.

4.2 Contributions of Affective Factors and Elements

The incorporation of users’ affect into the design process of products and services is an innovative challenge. The findings of this study will help designers to better understand human affect while providing explicit hints for the design process. Novel affective features such as “social connection” and “healing and relaxation” can be expected to create added value in addition to “usability,” “quality” and “functionality.”

Specific details on how to add such new features to products and services can also be interpreted as the elements found to contribute to each factor. As indicated in Fig. 1, once designers decide what kind of affective experience to provide through products or services, they could refer to the affective elements extracted in this study to specify functions or design parameters of products or services. Then they could further associate the affects to be elicited in users with the design parameters. For example, when trying to design affect-eliciting products and services related to “social connection,” designers could refer to the affective elements that comprise the “social connection” factor, such as “connections with beloved people,” “supportive or encouraging people or things,” “feeling of belonging and acceptance” and “sharing things or experiences with others.” Then it is possible for designers to embed the function to share experiences or works into products to provide users with affective experience. As validated in this study, sharing things with others elicits people’s positive affects. If functionally and technically it becomes easier for



Statement: On the last day before graduation, several university students woke up early and went to see the sunrise together. For them, this meant new starts and new challenges in their lives; they wanted to enjoy this final moment with their friends.

Fig. 3 Stimulus A and its factor scores.

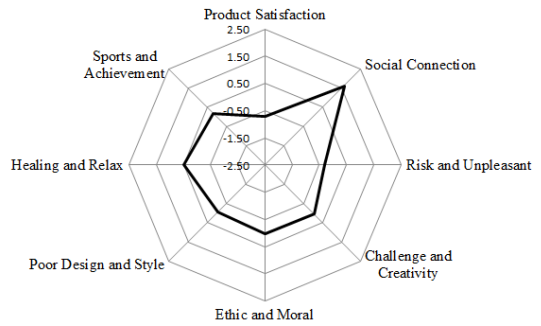


Fig. 4 Stimulus B and its factor scores.

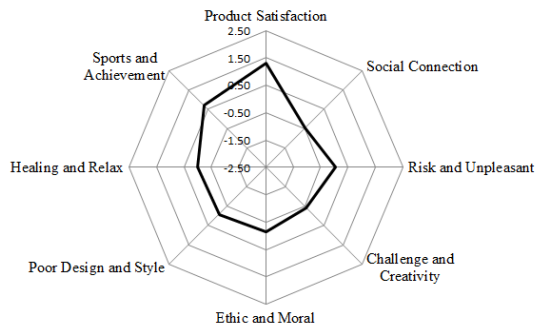
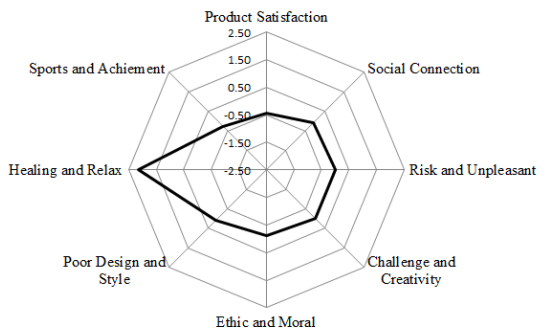


Fig. 5 Stimulus C and its factor scores.



users to share their works or outputs with others, their affects might possibly be evoked.

Additionally, with the factor structure described in this paper, it becomes possible to assess, visualize and compare how products and services are capable of providing customers with affective experiences.

4.3 Coverage of Affective Elements

To a certain extent, this study has verified the coverage of the extracted affective elements. Element extraction was conducted in three phases, with narrative descriptions collected separately in different countries. It was observed that the elements extracted in the first and second phases could cover all the elements extracted in the third phase. Consequently, it can be concluded that elements extracted in this study could well cover the broad spectrum of human affect triggers. However, considering the sample size of the narrative descriptions obtained, it is necessary to gather additional linguistic information regarding the affective experiences of people in future research to further ensure thorough representation of all possible affective elements.

4.4 Other Modalities to Evoke Affective Responses

It is important to note that in this research, only pictures and statements (visual information) were adopted to elicit participants' affects. Previous research [26] indicated that high-resolution pictures could be used to elicit affective responses about products and yield reliable results, and thus this study employed the visual stimulus. However, human affects might also be elicited by other senses (acoustic, haptic, etc.) and real experiences obtained while using products or receiving services. Thus, it is necessary to take into consideration various modalities and ways to evoke human affects in future research.

4.5 Cultural Influences on Affective Factors and Elements

Although an initial step has already been made to explore elements and factors contributing to the affect elicitation, it is critical to note that this study

was limited to Japanese participants. Considering the possible cultural influences on affective responses, it is necessary to further conduct broad intercultural comparative studies. To clarify any cultural influences on affective responses, comparisons between countries with greater cultural differences are essential. Consequently, obtaining more samples and acquiring samples from various countries is of great importance for future research.

5 CONCLUSION

This study aimed to extract elements that contribute to the generation of human affects. For this purpose, free narrative descriptions about things and experiences that might elicit particular affects were collected from participants in three countries. Forty-three affective elements were then extracted from the descriptions. To validate the extracted affective elements, a questionnaire-based investigation was conducted. Results revealed eight factors that contribute to the generation of human affects. These factors were named "affective factors." It was also confirmed that the extracted affective elements were related to human affects in various ways.

However, the need to acquire more samples, ideally in various countries, still remains a critical issue for future research. More evidence is needed to further ensure their coverage. Meanwhile, to better investigate possible cultural influences on affective elements, it is necessary to gather data from various countries having distinctly different cultures.

The affective elements proposed in this paper provide suggestions about how human affects can be more effectively elicited while also serving as a reference for product and service design. It is expected that practical methodologies to more fully utilize the results of this study can be developed in future research. Furthermore, in order to evaluate the practical effectiveness of the affective elements and factors found in this research, feedback from the designers and practitioners should also be carefully examined. Practical applications and the evaluation of the usefulness of the findings of this research should also be studied in future research.

ACKNOWLEDGMENTS

The authors would like to thank the associate editor and two anonymous reviewers for their helpful comments in improving the quality of the present work.

This research was supported in part by Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Scientific Research (B) 21310091.

REFERENCES

- [1] Jordan, P.: "Designing Pleasurable Products: An Introduction to the New Human Factors," Taylor and Francis (2000)
- [2] Umemuro, H.: "Affective Technology, Affective Management, towards Affective Society," *Human-Computer Interaction: Ambient, Ubiquitous, and Intelligent Interaction*, Springer, Vol.5612, pp.683–692 (2009)
- [3] Fulton, J.: "Physiology and Design," *American Center for Design Journal*, Vol.7, No.1, pp.7–15 (1993)
- [4] Norman, D.: "Emotional Design: Why We Love (Or Hate) Everyday Things," Basic Books (2004)
- [5] Umemuro, H.: "Affective Technology: Beyond Usability," *Proceedings of the 13th IEEE International Symposium on Consumer Electronics (ISCE2009)*, pp.373–374 (2009)
- [6] Blythe, M. A., Overbeeke, K., Monk, A. F., Wright, P. C. (eds): "Funology: From Usability to Enjoyment," Kluwer (2004)
- [7] Tractinsky, N., Katz, A., Ikar, D.: "What is Beautiful is Usable," *Interacting with Computers*, Vol.13, No.2, pp.127–145 (2000)
- [8] Bruseburg, A., McDonagh-Philip, D.: "New Product Development by Eliciting User Experience and Aspirations," *International Journal of Human-Computer Studies*, Vol.55, No.4, pp.435–452 (2001)
- [9] McDonagh, D., Bruseberg, A., Haslam, C.: "Visual Product Evaluation: Exploring Users' Emotional Relationships with Products," *Applied Ergonomics*, Vol.33, No.3, pp.231–240 (2002)
- [10] Mahlke, S., Lindgaard, G.: "Emotional Experience and Quality Perceptions of Interactive Products," *Human-Computer Interaction*, Part I, LNCS 4550 (J. Jacko ed.), pp.164–173 (2007)
- [11] Heijden, H.: "Factors Influencing the Usage of Websites: The Case of a Generic Portal in the Netherlands," *Information and Management*, Vol.40, No.6, pp.541–549 (2003)
- [12] Kim, J., Lee, J., Choi, D.: "Designing Emotionally Evocative Homepages: An Empirical Study of the Quantitative Relation between Design Factors and Emotional Dimensions," *International Journal of Human-Computer Studies*, Vol.59, No.7, pp.899–940 (2003)
- [13] Hsiao, K.-A., Chen, L.-L.: "Fundamental Dimensions of Affective Responses to Product Shapes," *Industrial Ergonomics*, Vol.36, No.6, pp.553–564 (2006)
- [14] Chiu, H.-C.: "A study on the Cognitive and Affective Components of Service Quality," *Total Quality Management*, Vol.13, No.2, pp.265–274 (2002)
- [15] Jiang, Y., Wang, C.-L.: "The Impact of Affect on Service Quality and Satisfaction: The Moderation of Service Contexts," *Journal of Services Marketing*, Vol.20, No.4, pp.211–218 (2006)
- [16] Ayas, E., Eklund, J., Ishihara, S.: "Affective Design of Waiting Areas in Primary Healthcare," *The TQM Journal*, Vol.20, No.4, pp.389–408 (2008)
- [17] Enkawa, T.: "我が国文化と品質：精緻さにこだわる不確実性回避文化の功罪," Japanese Standards Association (2009) (in Japanese)
- [18] Pine J. B., Gilmore, J. B.: "Welcome to the Experience Economy," *Harvard Business review*, Vol.76, No.4, pp.97–105 (1998)
- [19] Schmitt, B.: "Experiential Marketing," *Journal of Marketing Management*, Vol.15, No.1–3, pp.53–67 (1999)
- [20] Nagasawa, S.: "Customer Experience Management Influencing on Human Kansei to MOT," KES 2006, Part III, LNAI 4253 (B. Gabrys, R. J. Howlett, and L. C. Jain eds.), pp. 980–987 (2006)
- [21] Berry, L., Carbone, L., Haeckel, S.: "Managing the Total Customer Experience," *Sloan Management Review*, Vol.43., No.3, pp.84–90 (2002)
- [22] Gentile, C., Spiller, N., Noci, G.: "How to Sustain the Customer Experience: An Overview of Experiment Components that Create Value with the Customer," *European Management Journal*, Vol.25, No.5, pp.395–410 (2007)
- [23] Verhoef, P., Lemon, K., Parasuraman, A., Roggeveen, A., Tsiros, M., Schlesinger, L.: "Customer Experience Creation: Determinants, Dynamics and Management Strategies," *Journal of Retailing*, Vol.85, No.1, pp.31–41 (2009)
- [24] Frow, P. and Payne, A.: "Toward the 'Perfect' Customer Experience," *Journal of Brand Management*, Vol.15, No.2, pp.89–101 (2007)

- [25] Nagamachi, M.: “Kansei/Affective Engineering and History of Kansei/Affective Engineering in the World,” *Kansei/Affective Engineering* (Nagamachi, M., eds.), CRC Press, pp. 1–2 (2010)
- [26] Daha, E., Srinivasan, V.: “The Predictive Power of Internet-based Product Concept: Testing Using Visual Depiction and Animation,” *Journal of Product Innovation Management*, Vol.17, No.2, pp.99–109 (2000)
- [27] Bradley, M., Lang, P.: “Measuring Emotion: Behavior, Feeling, and Physiology,” *Cognitive Neuroscience of Emotion* (Lane, R., Nadel, L., eds.), Oxford University Press, pp. 242–276 (1999)

APPENDIX

1 Question items in Japanese language derived from affective elements used for Japanese participants

- (1) 機能が高い
- (2) 機能が低い
- (3) 最先端技術
- (4) 品質が良い
- (5) 品質が悪い
- (6) 使いやすい
- (7) 使いにくい
- (8) 生理的欲求を満たす (食欲, 睡眠欲, 性欲など)
- (9) 自然の風景
- (10) 心地よい音, 匂い, 手触り (肌触り), 味
- (11) 不愉快な音, 匂い, 手触り (肌触り), 味
- (12) 危険もしくは潜在的な危険をもたらすリスクや不確実性
- (13) 精神的, 肉体的にリラックスする
- (14) 静寂, くつろぎ
- (15) 珍しいもの, ユニークなものを所有する
- (16) 自分仕様にカスタマイズする
- (17) 優越感
- (18) 愛する人とのつながり (家族, 親友, 恋人など)
- (19) 自然災害
- (20) 絆 (もの, 家, 故郷, 母国)
- (21) 孤立感, 疎遠
- (22) ものや経験を他人と共有する
- (23) 他人とコミュニケーションする
- (24) 人生の目的を明らかにする
- (25) 応援してくれる人, 励ましてくれるもの
- (26) 趣味, 興味, 知的活動
- (27) 良い雰囲気や環境
- (28) 思慮深い人や行動
- (29) 思慮の足りない人や行動
- (30) 知識, スキルを応用して, 創造的なことをする
- (31) 継続的に学習, 努力する
- (32) 成功, 達成感, 報われた感覚
- (33) グループ, 社会への帰属感, 受け入れられている感覚
- (34) 日常生活から解放される
- (35) スポーツ
- (36) 芸術, アート
- (37) 道徳的行動
- (38) 非道徳的な行動
- (39) 思いやりのある人や行動
- (40) 動物や人間の赤ちゃん, かわいい動物や子供
- (41) 一つの活動に集中, 没頭する
- (42) デザインコンセプトが良い
- (43) デザインコンセプトが悪い
- (44) デザインが良い
- (45) デザインが悪い
- (46) 材質が良い
- (47) 材質が悪い
- (48) 質感が良い
- (49) 質感が悪い
- (50) 美的なもの
- (51) 醜いもの
- (52) 自尊心を高める
- (53) 自尊心を傷つける
- (54) ものや人についての大切な思い出
- (55) 人間味