MEASURING THE EFFECT OF SURVEY QUESTION TYPES IN KOREA ON THE RESPONDENTS' EMOTIONAL REACTION ON IT PRODUCTS

[1] SANGMIN LEE, [2]JOO HYUN PARK, [3]HAN YOUNG RYOO*

[1]Department of Business Convergence, Cha University, Republic of Korea

[23]Department of Content Convergence, Ewha Womans University, Republic of Korea

E-mail: [1]slee@cha.ac.kr, [2]joohpark@ewha.ac.kr, [3]hyryoo@ewha.ac.kr

*Corresponding Author

ABSTRACT

The traditional IT product design focused on the most optimized physical functions and economic feasibility. However, the trends are changing to adopt an emotional design into research and development by measuring and analyzing the human beings' emotion. Many emotion design studies on IT products measure users' emotion through the survey questionnaire with emotion words. Therefore, structuring and organizing survey question items are critical. The objective of this study is to find an effect of different survey question types on emotion evaluation of the websites, which can be referred to as an example of IT products. In order to achieve the objective, this study measured the emotion level of the website users by applying different question items with different sentence lengths and expression types for the same website. This study found that different question type has no significant effect on human emotion evaluation. The findings from this study are a lot different from the research reported in the literature outside the Korea. This implies that additional research might be necessary by considering the cross-cultural factors into question types when developing the survey questionnaire for Korean.

Keywords: *IT Product, Question Type, User's Emotion, Korean Survey, Measuring Emotion*

1. INTRODUCTION

With the advancement of technology, the design of products and services are adopting more ITs. As users' knowledge levels and expectations for information technology (hereafter IT) products and services increase, users want more diverse needs and emotions on IT products and services. This phenomenon have also influenced in the evaluation of IT products and services. In the past, physical functions and economic feasibility aspects were considered as criteria for evaluating IT products and services. However, today's IT products and services are evaluated not only for usability but also for the needs and emotions (sensitivity and value) of users on IT products and services. In other words, the trends are changing to adopt an emotional design into research and development (R&D) by measuring and analyzing the human beings' emotion. Since the human sensibility ergonomics is being used in IT product development field. This is because how users are satisfied with the sensibility of IT products and services have become the basis

for selecting IT products and services. Therefore, the evaluation of human being's emotion on IT products and services is important. In order to satisfy users 'emotions, it is very important to grasp users' desires and approach them from emotional aspects of users [1]. The most popular method of measuring the human beings' emotion in the field of emotional design research is evaluating the users' emotions using the survey questionnaire with the most common emotional vocabularies [2]. Therefore, the evaluation of users' emotion with emotional words is the basic and critical research method for the emotion design of IT products and services. However, the inconsistencies of the question types in the questionnaire for the research are frequently found. For example, some researchers present only emotional word in questions in the questionnaire [3][4], and others presents emotional words with more detailed situation or with sentences for the specific purpose [5][6].

The precedent research for developing the survey questions for the evaluation shows that the different question types can cause the different effects of the evaluations. Researchers recommended making the questions having the length of sentences as short as possible. It is also recommended to use simple and plain words to increase the understandability for the survey participants [7]. Some studies in overseas even found that the methods of asking questions, the number of questions, the length of pages, the layout of questionnaire, and the question types can affect the result of evaluations. However, it is rarely found that considers these factors into emotional design research for website development in Korea. These problems might have been caused by the different characteristics of culture and environment between the East and the West, or even among the countries. These issues are currently under vigorous research in various perspectives in the cross-cultural research field.

Therefore, this study focused on investigating whether or not the above factors including the question types have an effect on user's emotion measurement of the websites in Korea. Then, the results between Korea and those in overseas were examined further to see if there exist any differences. This would help emotional design organizations in IT industry in Korea finding what to consider when making a survey questionnaire. Moreover, this can provide a guideline of evaluating question types that contains emotional words in the questionnaire in Korea.

2. LITERATURE REVIEW

As previously stated, many researches were performed to find out if the methods of asking questions, the number of questions, the number of pages, the length of pages, and the layout of questionnaire have an effect on the human emotion evaluations. Edwards, Roberts, Sandercock, and Frost [8] provided a guideline for drawing up a questionnaire through the meta-analysis research that investigated the impact of the length of the questionnaire on the evaluation of users' emotion. Healey, Macpherson, and Kuijten [9] emphasized the importance of survey design since it enhances the data quality by increasing the participant's response rate, and as a result, they proposed principles for the survey design. Dillman [7] believed that the different question types have a great influence on the emotion evaluation. Thus, he suggested using relatively short, plain, and easily understandable words for the questions. Most

researches emphasize the importance of survey design to increase the participant's response rate and to enhance the data quality. Recently, many studies propose a guideline for the web survey which is the most commonly used survey method in these days. Especially, lots of technical and software related issues are being reported for the web survey. For example, in case of mal-function for changing the mark, unable to multi-mark where it is not supposed to, in case of not proceeding to the next page, or exiting the survey with all blank items, etc. To prevent these kinds of technical problems, researchers continuously emphasize developing the explicit web survey system [10] [11].

As stated above, the survey design is a critical factor in order to increase the participant's response rate and to enhance the quality of the survey data. However, it is hard to find relevant studies that considered this factor in Korea.

Unlike other countries, the unique characteristics of Korean culture could be one of the reasons that caused this problem. The country level cross-cultural research has been performed by many scholars such as Hofstede [12], Schwartz [13], Marcus [14], House, Paul, Mansour, peter, and Vipin [15]. Most researchers focused on positive verification of the cultural differences by dividing the research domain into two, the East and the West. The typical example is distinguishing the Eastern culture as collectivism, and the West as individualism culture. House, Paul, Mansour, Peter, and Vipin [15] classified Korea, China, and Japan as Confucianism cultural area that exist authoritarianism, collectivism, and regional particularism. According to You and Shim [16], the cultural characteristics of the country provide useful information to understand the people and the nation. They stated that the cultural characteristics of Korean people can be defined as public self-consciousness, vertical organizational collectivism, compassionate interpersonal relations, and consequentialism.

As seen above, most recent research findings emphasized the importance of the sensitivity of IT products and services. But there were no clear guidelines or structures for evaluation of emotions. Therefore, it is essential to carry out a structural research that can enhance the emotional evaluation of IT products and services. In addition, no study was found that compares cultural differences on emotional evaluation of IT products and services between abroad and domestic. Therefore, the result of this research could be different from those in

overseas countries. Based on these understandings, this study focused on empirical investigation of how the different question types affect the users' emotion evaluation in Korea. In addition, this study examined if the experiment results reported from overseas countries are applicable to Korea. Finally, this study will propose a direction for creating questions having emotional words in Korea.

3. EMOTION MEASUREMENT BY SURVEY QUESTION TYPE

3.1 Overview

This study performed in following steps. Firstly, the survey that measures users' emotion using different survey questions by its length and type for the same website was conducted. In order to satisfy this purpose, the main page of the website was selected for the research. Secondly, emotional words were selected from the vast website based emotional vocabulary literature research. Lastly, a web based survey system was created by classifying question types based on the most frequently used question types in emotional design researches.

Measurement of users' emotion by different survey question types were conducted twice in the web based survey system. The objective of first measurement was to figure out if there are any technical problems with the web survey system as well as roughly finding any differences by different question types. After analyzing the results of the first survey, the questionnaire was revised in order to perform more precise and in-depth evaluation of emotion.

3.2 Selection of emotional words and survey question types

Hong, Lee, and Jin [17] studied the emotional words on the websites for the human emotion measurement. Based on their research, 23 emotional words were selected for this study. The selected words are listed in Table 1.

Table 1: Emotional Word List

Intense	Refreshing	Funny
Luxurious	New	Young
Cute	Refined	Calm
Unique	Cool	Classical
Stylish	Mysterious	Comfortable
Futuristic	Leisurely	Gorgeous
Cheerful	Unfamiliar	Unordinary
Neat	Free	

The evaluation questions were classified into three types according to sentence expression types which is based on the most frequently used method

for the emotion design research. Table 2 shows that the emotional word 'intense', as an example, can be used in three different types of sentences.

Table 2: Survey Question Types

Type	Survey Question
1	Intense.
2	The design of this website is intense.
3	I feel that the design of this website is intense.

3.3 Development of web based survey system

In order to test our research objective, the main page of the websites by one of the FWD (Favourite Website Award) awardee was selected. The web based survey system was created adopting 23 emotional words and three different question types. After browsing the main page of the website, all the participants were asked to answer for the question items to indicate on a 7-point Likert scale, from 'Strongly Agree (1)' to 'Strongly Disagree (7)'.

The three different web based survey systems were created based on three different survey question types. All participants were asked to evaluate one out of three different survey systems.

Technical problems often occur in web-based survey system. In order to avoid these problems, the initial three web based survey system were modified for the better evaluation after the pilot test by 30 people in total, 10 people for each system. The Figure 1 shows the captured image of three different web survey systems by three different question types.
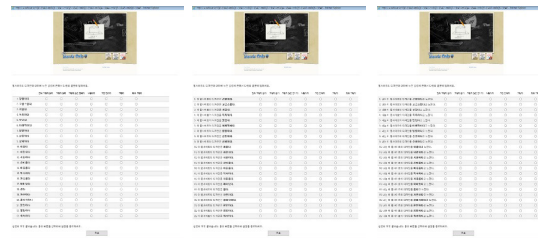

Figure 1: Captured Images of Three Different Types of Survey Systems

3.4 The first emotion measurement by different question types

The participants of the survey were selected from college students in Seoul, Korea. A total of 150 students participated for three different survey questionnaires. Each questionnaire was answered by 50 students. The results of emotion evaluation

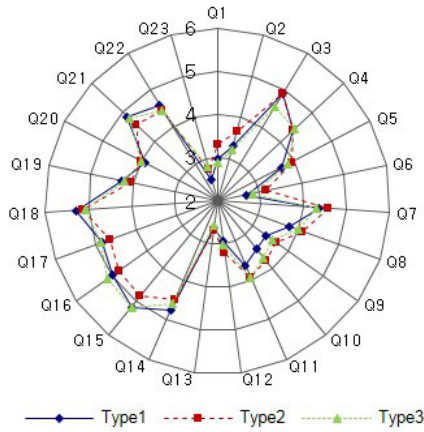by three different question types are illustrated in Figure 2.

Figure 2: Average Comparison by Question Type - 1st Measurement

The Figure 2 represents the comparison of average value of 23 question items for three different question types. The average values for 23 items were slightly different, but not much big differences were found. In order to find the differences of the emotion evaluation by the survey question types, the ANOVA was performed with the significance level of 0.05. The result of ANOVA is represented in Table 3. Table 3 also shows that no differences of emotion evaluation were found for 23 question items regardless of different survey questionnaire types.

Table 3: ANOVA Result of Emotion Evaluation - 1st Measurement

Question	Sum of Square	Mean of Square	F Ration	P-Value
Q1	5.493	2.747	2.267	.107
Q2	5.320	2.660	1.821	.165
Q3	4.093	2.047	1.352	.262
Q4	.093	.047	.032	.969
Q5	2.013	1.007	.658	.519
Q6	5.560	2.780	1.928	.149
Q7	1.960	.980	.482	.618
Q8	3.053	1.527	1.013	.366
Q9	2.080	1.040	.760	.470
Q10	2.893	1.447	.917	.402
Q11	3.000	1.500	.971	.381
Q12	2.280	1.140	.805	.449
Q13	.253	.217	.103	.902
Q14	1.693	.847	.471	.625
Q15	3.413	1.707	1.457	.236
Q16	2.573	1.287	1.180	.310
Q17	1.653	.827	.534	.587
Q18	1.053	.527	.380	.685
Q19	1.053	.527	.307	.736
Q20	.280	.140	.064	.938
Q21	2.173	1.087	.814	.445
Q22	.653	.327	.228	.797
Q23	2.893	1.447	1.037	.357

3.5 The second emotion measurement by different question types

According to the first measurement, no differences of average values were found for all 23 question items. It also showed that the results are not much correlated with the question types. For the first measurement, the results were analyzed having each participants evaluate only one image. However, for the second measurement, one more image was added so as to have each participant evaluate two images. The image for the first measurement adopted indistinctive and achromatic colors. However, the strong contrast of the colors was used for the image that was used for the second measurement. Moreover, out of 23 emotion words, the word 'unordinary' was changed to 'ordinary' in order to prevent participants from feeling negatively. Additionally, the web survey system was modified to make participant concentrate more on the survey. The revisions are as followings.

1) Showing two images randomly to participants, and displaying the images for 15 seconds before starting the survey.

2) Web survey starts with full screen to prevent participants from performing other tasks on the machine.

In Figure 3, the left side image illustrates the captured screenshot of displaying the image with full screen for 15 seconds, and right side image represents evaluation screen shot.
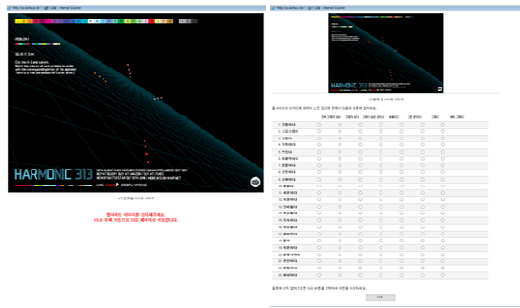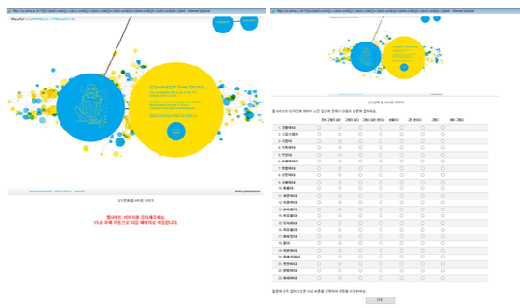
Figure 3: Captured Images of Web Survey Systems for Second Emotion Measurement

Participants evaluated two images per one question types. A total of 186 students participated for three different survey question types. Each questionnaire was answered by 62 students. The results of emotion evaluation for two images by three different question types are illustrated in Figure 4.
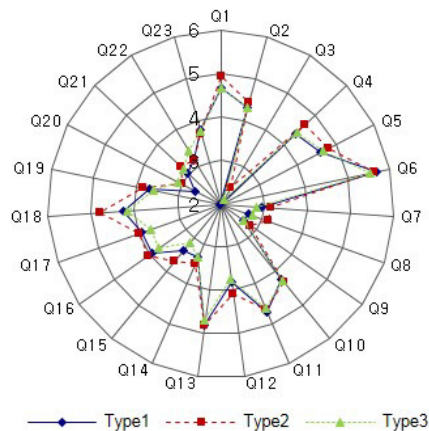

Figure 4: Average Comparison by Question Type for Image-1

For image-1, tiny differences were found for some question items, but no big differences were found throughout the entire question items. In order to figure out if survey question types have an impact on the emotion evaluation, ANOVA was performed again with the significance level of 0.05. The result of ANOVA for the second measurement is shown in Table 4.

Except the 18th item that used emotional word of 'young' (F=.380, p=.027), no relationship was found between 'survey question type' and 'emotion evaluation'.

Table 4: ANOVA Result of Emotion Evaluation for Image-1

Question	Sum of Square	Mean of Square	F Ration	P-Value
Q1	2.753	1.376	.930	.396
Q2	.387	.194	.120	.887
Q3	7.000	3.500	2.909	.057
Q4	2.935	1.468	.815	.444
Q5	1.387	.694	.436	.647
Q6	.656	.328	.250	.779
Q7	3.043	1.522	.923	.399
Q8	7.559	3.780	2.701	.070
Q9	1.548	.774	.508	.602
Q10	.140	.070	.033	.967
Q11	.333	.167	.116	.891
Q12	3.882	1.941	.941	.392
Q13	.613	.306	.191	.826
Q14	.871	.435	.247	.782
Q15	8.849	4.425	3.047	.050
Q16	2.398	1.199	.644	.526
Q17	2.548	1.274	.666	.515
Q18	13.462	6.731	3.670	.027
Q19	1.882	.941	.469	.626
Q20	7.194	3.597	2.204	.113
Q21	1.430	.715	.540	.584
Q22	2.753	1.376	.951	.388
Q23	.204	.102	.056	.946

The results for image-2 are pretty similar to those in image-1. Again, slight differences were found for some question items, but no big differences were found throughout the entire question items.
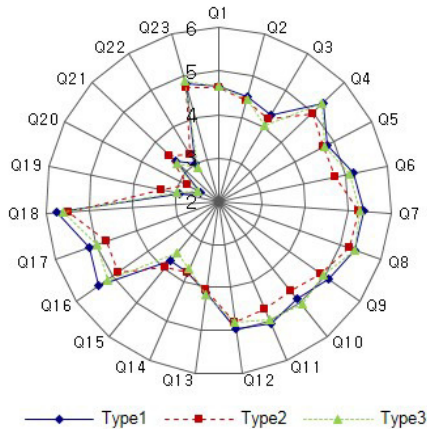
Figure 5: Average Comparison by Question Type for Image-2

According to ANOVA with the significance level of 0.05, no relationship was found between 'survey question type' and 'emotion evaluation' for the entire 23 questions. The result of ANOVA for image-2 is shown in Table 5.

Table 5: ANOVA Result of Emotion Evaluation for Image-2

Question	Sum of Square	Mean of Square	F Ration	P-Value
Q1	.011	.005	.003	.997
Q2	.290	.145	.104	.901
Q3	2.978	1.489	.712	.492
Q4	4.774	2.387	2.039	.133
Q5	.226	.113	.086	.918
Q6	6.333	3.167	2.267	.107
Q7	.419	.210	.182	.834
Q8	.785	.392	.285	.753
Q9	1.204	.602	.379	.685
Q10	5.495	2.747	1.875	.156
Q11	4.290	2.145	1.681	.189
Q12	.978	.489	.288	.750
Q13	.290	.145	.074	.929
Q14	.462	.231	.130	.879
Q15	5.946	2.973	1.977	.141
Q16	8.806	4.403	2.839	.061
Q17	5.462	2.731	1.676	.190
Q18	2.355	1.177	.952	.388
Q19	6.527	3.263	2.001	.138
Q20	4.290	2.145	1.689	.188
Q21	2.333	1.167	.897	.410
Q22	3.882	1.941	1.626	.200

Q23	.806	.403	.236	.790

4. CONCLUSION

The study extended the research by Lee, Park, Kim and Ryoo [18] for further investigation of effects of question types on emotion measurement. Recently, emotional design research in IT products, which is targeting to measure and analyze the human being's emotion is being performed vigorously in various perspectives so as to use them for new IT product and service development. Many emotion design studies measures users' emotion through the survey questionnaire with emotion words. Therefore, structuring and organizing survey question items are critical since it would significantly affect the results of the evaluation.

The literature reported the importance of survey question items for a successful survey, and even factor analysis is required for statistically validating the items. However, the literatures regarding these issues in Korea were hardly found. Thus, the objective of this study was to find an effect of the different types of survey question items on the emotion evaluation for IT products and services. In order to achieve the objective, this study measured the emotion level of the website users by applying different question items with different sentence lengths and expression types for the same website. The website was randomly selected from FWD (Favourite Website Award) awardee sites.

This study found that different question type has no significant effect on human emotion evaluation. The findings from this study are a lot different from those in the literature outside the Korea. This might have been caused by different characteristics of the culture and the environment between Korea and other countries. According to the cross-cultural research, one of the notable characteristics for Korean might be the public self-consciousness, which one realizes that he/she is being observed. Also, Koreans have a tendency to express their opinions implicitly, and make much of the compassionate interpersonal relationships. These kinds of cultural characteristics probably made the survey participants figure out the meaning of the vague question items themselves regardless of different types of survey questions.

A study on the questionnaire design which has been actively carried out abroad shows that the difference of the survey question items affects the evaluation result. But in Korea, it showed different results. Foreign literatures emphasize short, clear, and concise sentences for the survey question items

[6]. However, instead of question type 1 in our research that simply express with one word, questions type 3 that expresses the sentence with detailed description might be more adequate and understandable for Koreans. It can be regarded as a result of cultural differences between Korea and abroad. This study is meaningful because it examines the types of survey questions according to the cultural difference between Korea and foreign countries. Therefore, for the survey in Korea, it is more important to consider the circumstances and detailed description for the survey questions than considering the different question types. Moreover, expression of the survey objective, survey sequence, and structure of the survey has to be considered as well. In case of developing web survey system, it is obvious that technical errors have to be minimized.

This study academically investigated the different cultural impact on survey question types between Korea and other countries. It was found that the results of the survey development research in Korea are different from those in overseas countries. This implies that additional research might be necessary by considering the cross-cultural factors into question item type when developing the survey questionnaire for Korean. Human emotions on IT products and services are important. In order to evaluate these emotions, we suggested the guidelines of the survey using the most frequently used questionnaire items through the empirical research. However, this study has limitations in studying only the type differences of the survey items in order to measure human emotions. In the future, we will also need to consider the measurement on emotions that are specific to IT products and services. In addition to the differences in the questionnaire type, the layout and composition of the questionnaire should also be considered.

ACKNOWLEDGMENTS:

REFRENCES:

[1] J. Shin, and J. W. Hwang, "A Study in Preference Assessment according to Emotional Design Elements in the Website", Journal Korea Society of Visual Design Forum, Vol. 35, 2012, pp. 153-162.

[2] Plutchik, "Emotions and Life: Perspectives from Psychology, Biology, and Evolution", Washington, DC: American Psychological Association, 2003.

[3] J.H. Sun, K.J. Cho, and K. H. Han, "A Study on Sensibility of Web Page", Korean Journal of the Science of Emotion & Sensibility, Vol. 6, No. 4, 2003, pp. 33-40.

[4] H.W. Yoo, K.J. Cho, J.Y. Hong, and S.E. Park, "WebSES: Web Site Sensibility Evaluation System based on Color Combination", Korean Journal of the Science of Emotion & Sensibility, Vol. 7, No. 1, 2004, pp.51-64.

[5] S.H. Jeong, "Development a Self-report Questionnaire-type Scale for Measuring User's Emotions while using a Product", Korean Journal of the Science of Emotion & Sensibility, Vol. 10, No. 3, 2007, pp. 403-410.

[6] J.H. Park, and H.Y. Ryoo, "Emotion of People with Visual Disability for Enhancing Web Accessibility", Korean Journal of the Science of Emotion & Sensibility, Vol. 11, No. 4, 2008, pp. 589-598.

[7] D.A. Dillman, "Mail and Internet Surveys: the Tailored Design Method", Hoboken, New Jersey: John Wiley & Sons, Inc., 2007.

[8] P. Edwards, I. Roberts, P. Sandercock, and C. Frost, "Follow-up by Mail in Clinical Trials: Does Questionnaire Length Matter", Controlled Clinical Trials, Vol. 25, 2004, pp.31-52.

[9] B. Healey, T. Macpherson, and B. Kuijten, "An Empirical Evaluation of Three Web Survey Design Principles", Marketing Bulletin, Vol. 16, 2005, pp.1-9.

[10] M.P. Couper, "Web Surveys: A Review of Issues and Approaches", Public Opinion Quarterly, Vol. 64, 2000, pp.464–494.

[11] D.J. Solomon, "Conducting Web-based Surveys", Practical Assessment Research & Evaluation, Vol. 7, No. 19, 2001, pp.1-5.

[12] G. Hofstede, "Culture's Consequences: International Differences in Work-related Values", Beverly Hills, CA: Sage, 1980.

[13] S.H. Schwartz, "Are there Universal Aspects in the Content and Structure of Values", Journal of Social Issues, Vol. 50, 1994, pp.19-45.

[14] A. Marcus, "Cross-cultural User-interface Design", Proceedings of Human-Computer Interface International (HCII) Conference, Lawrence Erlbaum Associates, New Orleans, LA (USA), 2001, pp.502–505.

[15] R.J. House, J.H. Paul, J. Mansour, W.D. Peter, and G. Vipin, "Culture, Leadership, and

Organizations: the Globe Study of 62 Societies", London: Sage Publications, 2004.

[16] M. You, and H. Shim, "A Study on the Cultural Characteristics of Korean Society: Discovering its Categories using the Cultural Consensus Model", Korean Journal of Culture and Social Issues, Vol 19, No. 3, 2013, pp.457-485.

[17] S.Y. Hong, H.J. Lee, and K.N. Jin, "A Study on the Image Scale through the Classification of Emotion in Web Site", Korean Journal of the Science of Emotion & Sensibility, Vol. 12, No. 1, 2009, pp.1-10.

[18] S. Lee, J.H. Park, D. Kim, and H.Y. Ryoo, "Effects of Question Style in User's Emotion Survey: Using the Case of FWA's Best Award Winning Website", Proceedings of the 11th International Conference on Future Information Technology, Beijing (China), April 20-22, 2016, pp.707-711.