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KANSEI STUDY ON PAPER

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ABSTRACT

Paper is commonly used in our daily life. It plays important roles in many aspects of life. However, there are only a few studies related to paper. Summers et al (2008) discussed about haptic discrimination of paper while Dinse (2008) studied the design of banknote and specially focused on the haptic design. However, no one has explored how the feeling of paper influences the emotion of people. Therefore, this study was to construct the perceptual image of printing paper. As there are numerous categories of paper, this study limits the scope to the most frequently used kinds of paper for printing industry.

This study adopted Kansei Engineering to explore the relation between paper and the emotion of people. Total of three Kansei words and 27 paper samples were used in the experiment. Six participants were asked to measure the intensity level of feeling toward the 3 Kansei words for each sample during the experiments.

The results showed that the higher degree of smoothness was, the less "Classically elegant" was felt. The higher degree of whiteness was, the more "Classically elegant" was felt. The higher degree of bulk was, the more "Classically elegant" was felt. The higher degree of whiteness was, the more "Fashionable" was felt. The higher degree of bulk was, the more "Leisure" was felt. The higher degree of whiteness was, the less "Leisure" was felt. The results of this study can serve as references to the paper industry and printing industry, as well as books designers.

Keywords: *Kansei Engineering, paper*

1. INTRODUCTION

Nowadays, people pay more and more attention to the emotional dimension of product while consuming. Despite of product's functions, the psychological feeling from the product is sometimes the dominant factor in the decision of buying or not. When it comes to printing

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industry, the design of the book and the paper it uses are as important as the contents. These study focused on the most frequently used printing papers and tried to construct Kansei model based on peoples' feelings.

2. LITERATURE REVIEW

In Holik's [3] book, paper was categorized into graphic paper, packaging paper, hygienic paper, specialty paper and board grades. In the category of graphic paper, it can be further divided into printing and press paper and office and administration paper. Printing and press papers include newsprint, wood-containing natural printing paper, wood-free natural printing paper, and coated printing paper (wood-containing and wood-free). Due to the numerous categories of paper, this study only chose the most frequently used papers from wood-containing natural printing paper, wood-free natural printing paper, and coated printing paper as the samples for the study. (Table 1.)

Table 1: Classification of paper

<table>
<tr><td rowspan="4">1. graphic papers</td><td rowspan="3">1.1 printing and press papers</td><td>1.1.1 newsprint</td></tr>
<tr><td>1.1.2 wood-containing natural printing paper</td></tr>
<tr><td>1.1.3 wood-free natural printing paper</td></tr>
<tr><td>1.1.4 coated printing paper (wood-containing and wood-free).</td></tr>
<tr><td>1.2 office and administration papers</td><td rowspan="4"></td></tr>
<tr><td>2. packaging paper and board grades</td><td rowspan="3"></td></tr>
<tr><td>3. hygienic papers</td></tr>
<tr><td>4. specialty paper and board grades.</td></tr>
</table>

3. METHOD

3.1. Collecting and selecting Kansei Words for Papers

In order to find out the suitable adjectives for papers, a large number of adjectives related papers were collected from catalogs and website and some references from Kansei studies regarding to visual and tactile images. Then categories them into groups as in table 1. Due to the adjectives regarding to physical properties can shown by the parameters of papers. We

decided to choose the comprehensive ones that stated whole image of paper. Finally 3 adjectives were chosen as Kansei words, they were "classically elegant", "fashionable", "leisure." (Table1.)

Table 2: Adjectives for papers

visual	**pattern**	**comprehensive**
gorgeous	rule lines	textures
bright	rock-like	unique
shining	irregular	japanese-style
bright and dazzling	broken pattern	classically elegant
dazzling	strip lines	fashionable
bright	straight stripes	relaxed
gloss	three-dimensional	simple
uniform	cotton-like pattern	clean
metallic	**physical properties**	original
pearl luster	moisture	rough
foggy	the tear-resistant	noble
magnificent	opaque	comfortable
reflective	matt	going
unreflecting	translucent	quality
tactile	readability	smooth
rough	high thickness	advanced
smooth	good for writing	soft
solid	light	elegant
hard false	**tone**	delicate
solid	high-white	careful
smooth	special white	feel
stiff	white	leisure
thin	ivory	
soft	off-white	
embossed	yellow goose	
cloth's		
flower surface		
delicate		
satin silk-like		
sand-like		

3.2. Collecting and selecting Paper Samples

The samples were based on the 2 catalogs "Uncoated woodfree paper" and "Coated paper" from Yuen Foong Yu Paper Manufacturing Co., Ltd, which is the pioneer of private paper manufacturer in Taiwan. There are varies types of papers. The parameters to define paper include basic weight, thickness, gloss, smoothness, whiteness, and bulk. At first, there were

100 pieces of papers. KJ method was conducted to categorize the papers by 8 students major in design. Second, MDS and Cluster analysis were applied to find out the suitable number of group. It came out 12 groups. Third, we chose 3 of them from each group as the representative samples. There were totally 36 types of paper. We excluded 9 of 36 which didn't have enough data for regression analyze. Finally, there were totally 27 samples. (Table2.)

Table 3: 27 types of paper as the experiment samples

Group No.	Sample No.	Name of paper	Basic weight(g/m2)
1	1	Tittot Art Paper (Gloss)	105.5
1	2	Two-Side Coated Paper(Gloss)	89.7
1	3	Bulky two-side coated paper	75
2	4	Tittot Art Paper (Gloss)	158.2
2	5	Two-Side Coated Paper(Gloss)	190
2	6	Two-Side Coated Paper(Gloss)	126.6
3	7	Tittot Art Paper (Gloss)	126.6
3	8	Two-Side Coated Paper(Gloss)	126.6
3	9	Bulky two-side coated paper	135
4	10	Flamingo Super Art Paper (Gloss)	150
4	11	Flamingo Super Art Paper (Matt)	230
4	12	Two-Side Coated Paper(Matt)	190
5	13	M-print(Gloss)	54
5	14	M-print(Gloss)	65
5	15	M-print(Matt)	60
6	16	"Superior" uncoated woodfree	100
6	17	Hi-white uncoated woodfree	120
6	18	Hi-white bulky book paper	75
7	19	Tittot Art Paper (Matt)	80
7	20	Two-Side Coated Paper(Matt)	150
7	21	High bulky two-side coated paper	100
11	22	Uncoated woodfree	105.5
11	23	Uncoated woodfree	158.2
11	24	White uncoated woodfree	120
12	25	"Superior"Bit-coated woodfree	70
12	26	Bit-Coated Woodfree	120
12	27	Snow white uncoated woodfree	80

In order to better approach the goal of knowing people's feeling about paper. The scenario of reading was set to make the situation more familiar and natural. The form of samples were decided to be A5 size book-like but combined by empty pages. There were totally 36 books as the samples for following Kansei evaluation experiment.

3.3. Kansei Evaluation Experiment

There were 6 female participants, who were international and exchange students from China and Taiwan to Seoul National University in the age range 21-24. There were three Kansei words which were "classically elegant", "fashionable", "leisure." 5-point Likert scale was applied. Before starting, participants were instructed to carefully wash and dry their hands prior to participating in the experiment in an attempt to minimize inter-participant variation in skin conditions. There were 36 books on the table while there were 5 columns on the table marked by tape line which stand for the level toward Kansei words. By leafing over, observing, and feeling each book, participants ranked each book into one column. The strongest feeling toward the Kansei word should be ranked as 5, and the weakest feeling toward the Kansei word should be ranked as 1. The context of the experiment is shown on Figure1. After the Kansei experiment, a short interview was conducted regarding to the reason of measurement.

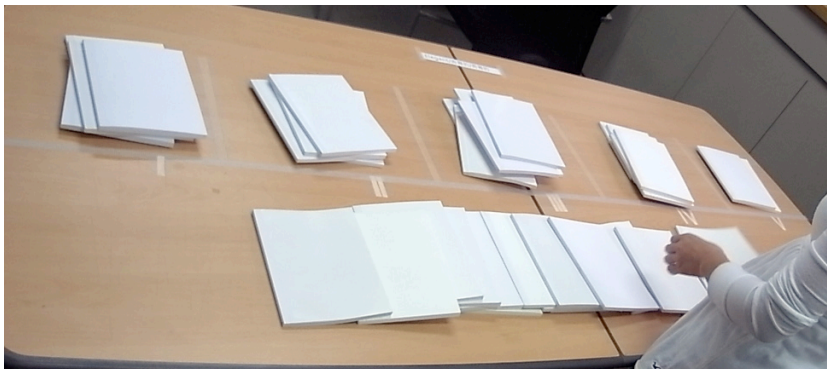

Figure 1: Experiment context

4. RESULT AND ANALYSIS

From the result of Kansei Evaluation Experiment, Multiple Regression Analysis was adopted. Rregression analysis helps us understand how the typical value of the dependent variable changes when any one of the independent variables is varied, while the other independent variables are held fixed.

From the Multiple Regression Analysis of adjective "Classically elegant", P=0.00<0.05, showed that the properties of paper had significant influence to the feeling of "classically elegant." Among those properties, the "smoothness" , "whiteness", and "bulk" had reached the significant level, while smoothness has negative influence and whiteness and bulk have positive influence. The higher degree of smoothness was, the less "Classically elegant" was felt. The higher degree of whiteness was, the more "classically elegant" was felt. The higher degree of bulk was, the more "classically elegant" was felt. (Table4.)

Table 4: Multiple Regression Analysis result of adjective "Classically elegant"

	Unstandardized Coefficients	Standardized Coefficients	P

	(B)	Std. Error	(Beta)	
thickness	-0.004	0.016	-0.022	0.83
gloss	-0.003	0.006	-0.08	0.658
smoothness	-0.001	0	-0.375	0.041
whiteness	0.045	0.016	0.302	0.01
bulk	1.4	0.508	0.463	0.012
Constant	-1.758	1.387	--	0.219
Adjusted R^2		0.744		
p		0		
Std error of the estimate		0.32394		
N		6		

Independent Variable	Thickness, gloss, smoothness, whiteness, Bulk
Dependent Variable	The feeling of "Classically elegant"

From the Multiple Regression Analysis of adjective "Fashionable", P=0.003<0.05, showed that the properties of paper had significant influence to the feeling of "Fashionable." Among those properties, the "whiteness" had reached the significant level. The higher degree of whiteness was, the more "Fashionable" was felt. (Table 5.)

Table 5: Multiple Regression Analysis result of adjective "Fashionable"

	Unstandardized Coefficients		Standardized Coefficients	P
	(B)	Std. Error	(Beta)	
thickness	0.008	0.028	0.049	0.769
gloss	-0.009	0.01	-0.264	0.366
smoothness	0.001	0.001	0.506	0.083
whiteness	0.103	0.028	0.638	0.001
bulk	0.203	0.882	0.062	0.82
Constant	-5.548	2.41	--	0.032
Adjusted R^2		0.335		
p		0.003		
Std error of the estimate		0.56280		
N		6		

Independent Variable	Thickness, gloss, smoothness, whiteness, Bulk
Dependent Variable	The feeling of "Fashionable"

From the Multiple Regression Analysis of adjective "Leisure", P=0.00<0.05, showed that the properties of paper had significant influence to the feeling of "Leisure." Among those properties, the "whiteness" and "bulk" had reached the significant level. While bulk has positive influence and whiteness has negative influence. The higher degree of bulk was, the more "Leisure" was felt. The higher degree of whiteness was, the less "Leisure" was felt. (Table 6.)

Table 6: Multiple Regression Analysis result of adjective "Leisure"

	Unstandardized Coefficients		Standardized Coefficients	P
	(B)	Std. Error	(Beta)	
thickness	-0.043	0.029	-0.195	0.147
gloss	0.02	0.01	0.445	0.06
smoothness	-0.001	0.001	-0.183	0.409
whiteness	-0.16	0.028	-0.766	0
bulk	2.402	0.892	0.571	0.014
Constant	13.198	2.438	--	0
Adjusted R^2		0.593		
p		0		
Std error of the estimate		0.56927		
N		6		

Independent Variable	Thickness, gloss, smoothness, whiteness, Bulk
Dependent Variable	The feeling of "Leisure"

5. DISCUSSION AND CONCLUSION

This paper described the development of Kansei models that quantify the feeling of printing papers. First, Kansei evaluation experiments using the 5-point Likert scale investigated the relation between the properties of paper and the feeling of participants. Based on the evaluation scores of the experiments, the Kansei models were constructed using multiple regression analysis. Most participants stated that in some similar samples, they could hardly tell the different. And also, due to the limited of time, there were few participants joined this experiment. Those reasons might influence the accuracy of the model. At the stage of choosing paper samples, those samples were shown by individual pieces. However, at the Kansei experiment stage, the samples were shown by the form of books. While reading a book, the participant can feel more than visual and tactile of paper such as the weight of book, the smell of book, and the sound from turning over the pages. Those factors might influence the feeling. In future studies, since we can only control the visual and tactile parameters of paper, the author will consider using the individual piece of paper as the experiment sample. And we will also reducing some similar samples and conduct the

experiment again to make the model more accurate. The results of this study can serve as references to the paper industry and printing industry, as well as books designers.

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