

## Consumers' Attitude on Textile Image Generated by CAD for Quick Response based Mass-Customization <sup>+</sup>

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### Abstract

Companies desire to increase total profits. Consumer's buying behavior depends on the nature of the product just like look, touch, and feel of fabric in apparel shopping on-line with Quick Response based mass-customization. The purpose of this study is to investigate the consumer's texture sensibility from textile image under on-line environment in order to give the direction for marketing strategy in apparel e-business.

Total 8 kinds of textile swatches representing each of 8 texture-sensibility-axes were selected for this research on the basis of finding in previous studies. The analyses of 60 questionnaires were conducted by frequency, mean, and standard deviation using SPSS 10.0.

The results of this research were as follows:

Under on-line environment, consumers recognized Homespun as natural, strong, and warm texture sensibility, but not as glossy, and transparent. Oxford was recognized by consumers as refreshing, and plain texture. Consumers recognized Muslin as flat and refreshing, Melton not as transparent but as warm, strong, dense, and natural, Habutae as thin, transparent, refreshing, flat, glossy, and soft, Linen as sandy, Suede not as transparent but as strong, and warm, and Terry as warm, and dense.

Key words: e-business, Mass-Customization, Texture Sensibility, Quick Response

### I. Introduction

Nowadays, e-business has been developed very fast in all business areas with information technology. In textile and fashion business, e-business has been applied for B2B (business to business), and B2C (business to consumer). There has been 48.1% increased sales volume through apparel e-business<sup>1)</sup>. But we still have

some difficulties handling apparel products in e-business regarding with high involvement product as high touch, and high culture. Also, consumers are used to buying apparel with trying on actual garments. The most crucial disadvantage is that consumers can't look-and-see, and touch-and-feel of the fabric. Based upon previous researches, most consumers hesitate to buy apparel through e-business

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because they can't make sure about its fabric, color, and size as it is<sup>2, 3)</sup>. Consumer would make better decisions if they had the right information on the attributes of apparel products. If they cannot get the required information readily, they will make wrong choices because of misjudgment. The improper provision of product information may therefore lead to consumer claims on apparel products, not only incurring monetary loss in the short run but also creating a negative brand image in the long term<sup>4)</sup>.

Modern consumers are trying to express fashion statements on their own characteristics with apparel. For differentiated marketing strategy to meet consumer's individualized special needs, e-business are doing mass-customization based on Quick Response. Quick Response (QR) strengthening supply chain management will eventually lead to demand activated and mass-customized production<sup>5)</sup>. Much data specification efforts are needed to effectively take the individual body features, style preference, and fabric preference of the consumer into account in e-business using CAD<sup>6, 7)</sup>. For example, Land's End, and 1c3d.com sell their apparel products in global market through internet shopping mall with QR based mass-customization for meeting individualized consumer's needs<sup>8)</sup>.

As we mentioned above, there are still several problems of on-line apparel shopping to interfere with consumer's buying behavior in respect to look and touch of fabric.

Previous researches have been focused on handle of fabrics<sup>9, 10, 11)</sup>, and physical property of fabric<sup>12)</sup>, and development of new textile materials<sup>13)</sup>. Very little verifying research has been done on consumer's attitude on texture sensibility from textile image for mass-customization in e-commerce. Therefore, the purpose of this study is

to investigate the consumer's attitude on textile image under on-line environment for apparel e-commerce.

## II. Review of literature

### 1. e-business

Zass(1996)<sup>14)</sup> indicated that e-commerce carried out not only information sharing, and maintaining relationship between industry, but also doing business based on internet. That is, e-business based on internet network is activity on commercial transaction reducing marketing channel costs without time, and space limitations. Also, it enhances more easy data collecting for customer management. It just makes shift from mass marketing to one-to-one marketing, relationship marketing, and database marketing.

e-business provides different marketing environment with "concurrent two way directions", and "individualized mutual reactions", such as dialog with customers, and providing information sharing for customers.

### 2. e-business in apparel industry

Wilson (1995)<sup>15)</sup> indicated that there were no limitations of product categories on internet on-line shopping, that is, no limitations of shopping opportunities exist according to product characteristics. But we can treat any kinds of products in e-business, the most crucial thing is to provide profit model of that business with increasing sales volumes, in other words, provoking consumers' buying behavior. Apparel sales volume in e-business is increasing steadily.

Especially, NPD (Neilson Panel Data, 1999)<sup>16)</sup> showed sales volume rate among product categories of travel (29.4%), computer (16.0%), books/music (8.4%), and apparel (6.8%) etc in B2C on-line market. Even though apparel e-business has been growing, there are still some problems, and limitations in apparel e-business. Apparel as high involvement product is the one of very important factors in human life not only protecting physical conditions, but also creating social, and psychological values. Consumers want to buy apparel with trying on actual garments in real market place, not cyber space for making sure the fabric, color, and size of products as it is.<sup>17, 2, 3)</sup>

According to NPD on-line research (1999)<sup>16)</sup>, 61% of the consumers who had no experiences for buying apparel products in e-business still have no intentions to buy apparel in e-business, even though they have been using internet for several years. By research of e-Buyersguide.com, the reasons not to buy apparel products in e-business were sizing, and fitting problems (28%), return problems due to differences in color, fabric, and design from viewing through computer monitor (18%), uncertain quality (14%), delivery costs (14%), and prices (9%) etc..

Thus, these limitations affect on consumers' buying behavior in apparel e-business. Buying propensity in apparel e-business was indicated that consumers bought casual wear rather than formal wear, and upper wear rather than lower part of the wear such as pants exception on casual trousers.<sup>18)</sup>

All of the above mentioned reasons came from not to see, and touch the actual garments in e-business. Therefore, in order to recovering these limitations we need to investigate consumer's texture sensibility under on-line environment to

indicate the characteristics of apparel products for on-line apparel shoppers.

### **3. Quick Response (QR) based Mass-Customization**

QR is the marketing strategy with information technology to promote efficiency of the information, and product flow from fiber to apparel industry, to marketing channel, and to final end-users building up inter and intra structure among industries in supply chain management. QR is pull system based upon consumer's demand rather than push system based upon one-way direction from manufacturer to channel members, and to final users.<sup>5)</sup> Mass-Customization is a compound notion with mass product and customization based upon QR to improve the quality of products with low service cost, and to provide customized products for individuals.<sup>19)</sup>

QR based mass-customization in e-business can build up the database system to reflect customers' preferences on fabrics, body configurations, and design variations through CAD/CAM apparel production with various market segmentations.

### **4. Texture sensibility of apparel products**

The fabric of apparel products is the most important factor for the quality and production cost of apparel. In e-business era, it is very important to refer to texture sensibility on characteristics of apparel products for internet apparel shoppers. Thus, we need to study texture sensibility under on-line environment in the respect of consumers' view-point. We

basically use the 8axes of texture sensibility of fabric for the guideline<sup>20)</sup> such as rustic-flat, thin-thick, soft-hard, and wet-dry. In 1972, Kawabata and Niwa evaluated the handle of fabric with three groups, that is, fabric for women' wear, winter fabric for men' wear, and summer fabric for men's wear. They accomplished, and distributed standard sample for industry. They finally developed KES-System (Kawabata Evaluation System) for measuring physical attribute of fabric.<sup>21)</sup> But it is too difficult to figure out consumers' texture sensibility only with handle of fabric.

Davis(1987)<sup>12)</sup> suggested the relation physical attribute of fabric with sensible adjectives. The assessment of hand of denim fabrics finished by enzymatic hydrolysis regarding the surface properties and the weight were evaluated that Tencel was to be the finest, the smoothest, the most flexible, the warmest, the most refined, the sleekest, the flossiest, the lightest, the softest, and the thinnest among four kinds of fabrics such as Tencel, cotton/Tencel, cotton, and cotton/PP.<sup>22)</sup> Kim(2002)<sup>23)</sup> investigated how the weave type, yarn twist, fabric count and fiber content of the worsted fabrics affect the subjective sensation of the hand. Yarn twist was significantly related to the characteristics and resilience. Weave structure affected surface characteristics, volume/warm-cool feeling and resilience. Fabric counts showed relations with volume/warm-cool feeling and the fiber contents with volume/warm-cool feeling, resilience and elastic properties. Kim & Na(2000)<sup>24)</sup> investigated the handle and mechanical properties of silk woven fabrics according to the fabric structure and yarn types. The hand adjectives were grouped as surface roughness, flexibility, sense of thermal, and dryness. Surface roughness was highly sensed

at satin fabrics of hard-twist yarn, noil yarn and spun yarn while it was not at the fabrics of normal satin and twill at all. Flexibility was reverse to surface roughness. Sense of thermal was felt highly at satin fabrics of noil-yarn, while low at plain fabrics of normal yarn. Dryness was high at satin fabrics of hard-twist yarn and while it was low at normal satin fabrics.

### III. Methodology

#### 1. Selection of fabric

For this research, 8 textile swatches were selected by the studies of Kim (2000)<sup>25)</sup>, and Chu (2000)<sup>26)</sup> with 8 axes on textiles: RUSTIC-FLAT, HARD-SOFT, DRY-WET, THIN-THICK.

One representative swatches per 1 axis were selected from the previous researches<sup>27, 28)</sup>: terry for rustic, melton for flat, oxford for hard, muslin for soft, habutae for thin, homespun for thick, linen for dry, and suede for wet.

#### 2. Research development

The purpose of this study was to investigate

<Table I> Textile swatches

Name of fabric	Fiber contents	Method of fabrication
homespun	wool 100%	plain weave
oxford	nylon 100%	plain weave
muslin	cotton 100%	plain weave
melton	wool 100%	twill weave
habutae	silk 100%	plain weave
linen	linen 100%	plain weave
suede	cotton 100%	plain weave
terry	wool 100%	Knitting

consumer's attitude on textile image under on-line for actual market situation of apparel e-business, due to not touch, and feel of fabric when consumer buying apparel product.

Based upon I-biznet research<sup>27)</sup>, internet using rate of age twenties and thirties were 95.2%. Therefore random sampling was done by age for twenties and thirties, female and male consumers for this research. To measure texture sensibility on textile image generated by CAD with programming HTML of scanning textile products, we developed questionnaire based on the studies of Samsung fashion research institute (2000)<sup>28)</sup>, and Kim (1996)<sup>20)</sup>. The analyses of 60 questionnaires were conducted by frequency, mean, and standard deviation using SPSS 10.0. Computer setting environment was 1280×1024 resolution with 96 DPI (dots per inch) for this experiment.

Measurement items for texture sensibility with 7 point Semantic Differential Method are as follows: glossy, soft, transparent, thin, sandy, strong, nice, dense, comfortable, high-class, modern, practical, sexy, elegance, refreshing, plain, flat, natural, smooth, and warm.

#### IV. Results and Discussion

Demographic information was as follows:

Respondents were female (52%) and male (48%). Twenties were over 50%. More than 10 months in internet using period was 88%, and internet using time per day were 1-2hours (37%), 2-3hours (22%), less than 1hour (20%), and more than 4hours (13%).

Consumers' texture sensibility on-line environment was as follows:

Consumers recognized Homespun as natural

<Table 2> Demographic information

Variables		Frequency	Percentage(%)
Sex	male	29	48.33
	female	31	51.67
	total	60	100.00
Age	20-24	13	21.67
	25-29	33	55.00
	30-39	14	23.34
	total	60	100.00
Internet using period	Less than 1month	3	5.00
	1-4 months	1	1.67
	4-7months	2	3.33
	7-10 months	1	1.67
	More than 10 months	53	88.33
	total	60	100.00
Internet using time per day	Less than 1 hour	12	20.00
	1-2 hours	22	36.67
	2-3 hours	13	21.67
	3-4 hours	5	8.33
	More than 4 hours	8	13.33
	total	60	100.00

(M=5.88, SD=1.39), strong (M=5.40, SD=1.63), and warm (M=5.30, SD=1.76) texture sensibility, but not as glossy, and transparent. Oxford was recognized by consumers as refreshing (M=5.42, SD=1.60), and plain (M=5.12, SD=1.40) texture. Consumers recognized Muslin as flat (M=5.44, SD=1.15) and refreshing (M=5.15, SD=1.56), Melton not as transparent but as warm (M=6.17, SD=1.63), strong (M=5.57, SD=1.67), dense, and natural, Habutae as thin (M=5.86, SD=1.56), transparent, refreshing (M=5.64, SD=1.45), flat, glossy, and soft (M=5.03, SD=1.69), Linen as sandy (M=5.22, SD=1.75), Suede not as transparent but as strong (M=5.43, SD=1.30), and warm (M=5.35, SD=1.35), and Terry as warm (M=5.15, SD=1.69), and dense (M=5.12, SD=1.55).

<Table 3> Texture sensibility on fabric

M(SD)

	glossy	soft	transparent	thin	sandy	strong	nice
Homespun	1.83(1.09)	2.30(1.68)	1.93(1.36)	2.28 (1.45)	4.80 (2.19)	5.40 (1.63)	4.02 (1.4 6)
Oxford	3.28(1.73)	3.27(1.71)	4.67(1.79)	5.05 (1.62)	5.02 (1.69)	3.55 (1.52)	3.76 (1.70)
Muslin	3.22(1.53)	3.82(1.56)	4.88(1.71)	5.44 (1.55)	4.47 (1.64)	3.21 (1.57)	4.12 (1.39)
Melton	2.13(1.67)	3.27(1.99)	1.69(1.22)	1.73 (1.30)	4.58 (2.23)	5.57 (1.67)	4.44 (1.50)
Habutae	5.18(1.73)	5.03(1.69)	5.72(1.48)	5.86 (1.56)	4.15 (1.76)	2.41 (1.51)	4.51 (1.22)
Linen	2.76(1.75)	2.75(1.74)	2.47(1.52)	4.61 (1.59)	5.22 (1.75)	4.22 (1.60)	3.92 (1.70)
Suede	2.71(1.78)	3.10(1.81)	1.95(1.32)	2.68 (1.57)	4.62 (1.81)	5.43 (1.30)	4.59 (1.43)
Terry	3.33(2.04)	4.55(2.10)	2.47(1.78)	3.03 (1.97)	3.25 (1.87)	4.83 (1.63)	4.61 (1.47)

<Table 3> continued

M(SD)

	dense	comfortable	high class	modern	practical	sexy	elegance
Homespun	3.97 (1.75)	4.50(1.60)	4.13(1.54)	3.87(1.52)	4.65(1.44)	2.58(1.74)	4.63(1.60)
Oxford	3.22 (1.66)	4.38(1.57)	4.05(1.72)	4.03(1.48)	4.15(1.23)	3.03(1.46)	4.10(1.37)
Muslin	4.05 (1.56)	4.47(1.35)	4.30(1.09)	4.23(1.32)	4.42(1.34)	3.39(1.64)	4.19(1.22)
Melton	5.25 (1.64)	4.92(1.84)	4.40(1.49)	4.55(1.65)	4.63(1.54)	2.59(1.46)	4.64(1.57)
Habutae	3.70 (1.83)	3.72(1.33)	4.80(1.22)	4.45(1.59)	3.55(1.52)	4.73(1.53)	4.66(1.23)
Linen	4.70 (1.78)	4.02(1.49)	4.17(1.39)	4.15(1.88)	4.07(1.21)	3.00(1.51)	4.20(1.16)
Suede	5.33 (1.34)	4.52(1.31)	4.38(1.42)	4.18(1.55)	4.48(1.23)	3.00(1.40)	4.36(1.35)
Terry	5.12 (1.55)	4.97(1.48)	4.62(1.66)	4.65(1.53)	4.42(1.29)	3.54(1.76)	4.37(1.33)

<Table 3> continued

M(SD)

	plain	flat	refreshing	natural	smooth	warm
Homespun	5.25(1.47)	3.54(1.71)	2.97(1.74)	5.88(1.39)	3.00(1.16)	5.30(1.76)
Oxford	5.12(1.40)	3.44(1.50)	5.42(1.60)	4.98(1.69)	3.47(1.50)	3.20(1.48)
Muslin	4.88(1.26)	5.44(1.15)	5.15(1.56)	4.95(1.69)	4.62(1.63)	3.10(1.65)
Melton	4.87(1.38)	4.54(1.60)	2.19(1.41)	5.21(1.61)	3.52(1.32)	6.17(1.63)
Habutae	3.95(1.36)	5.41(1.33)	5.64(1.45)	5.00(1.35)	4.90(1.67)	2.52(1.43)
Linen	4.60(1.09)	4.54(1.68)	4.24(1.80)	4.72(1.59)	3.70(1.33)	3.23(1.43)
Suede	4.35(1.65)	3.64(1.42)	2.54(1.41)	4.17(1.82)	3.45(1.24)	5.35(1.35)
Terry	4.18(1.66)	3.98(1.67)	2.80(1.60)	4.60(1.77)	3.95(1.75)	5.15(1.69)

## V. Conclusions

Consumer's buying behavior depends on look-and-see, and touch-and-feel of fabric in internet apparel shopping mall with Mass-Customization

based on QR system, Therefore, the purpose of this study is to investigate the consumer's texture sensibility under on-line environment for apparel e-business.

The most transparent, thin, refreshing, glossy,

soft, high class, elegant, smooth, and sexy texture sensibility perceived by consumers among 8 textile swatches was Habutae. The most perceived texture sensibilities by consumers among 8 textile swatches were as follows: plain, practical, and natural for Homespun, sandy for Linen, warm and strong for Melton, nice, modern, and comfortable for Terry, flat for Muslin, and dense for Suede.

Under on-line environment, "dense" and "strong" sensible adjectives depended on fabric density and method of fabrication could be viewed incorrectly, because of extended or reduced manipulation on the screen. Also, "soft" and "smooth" sensible adjectives perceived by touching and feeling the fabric at hand could be focused on attention to explain texture sensibility for apparel shoppers in e-commerce.

Even though color of the fabric can affect the consumers' texture sensibility, experimental environment was set with pastel color of fabrics to avoid of strong perceptions impacted by strong color. Because there were some possibility to provide little bit different color from same swatch under computer setting conditions. Also, it will be better to use strategic or tactical marketing approach for e-business with research findings from experimenting more various fabrics for further research.

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