The Journal of Behavioral Finance & Economics Volume 2, Issue 1, Spring 2012 **81-96**

ISSN: 1551-9570

Personality and Preference: A Laboratory Study

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Abstract

This paper attempts to explain the relationship between personality traits and commodity preferences. The norm-referenced test of personality has been used so as to infer economic behavior with a limited sample size. In this study, we use Lai's Personality Inventory to measure the introversion, extroversion, mental health, emotional stability and social adaptability of subjects. In addition to existing psychological measurements, we have also developed measurements for the rationale of decision-making over various commodities, based on the subjects' behavior of selectivity and utility maximization. The results have shown that the behavior in the pursuit of utility is associated with a person's emotional stability and mental health. Emotional instability and poor mental health often result in a deviation from utility maximization.

*Keywords:*Experimental Economics, Lai's Personality Inventory, Preference, Utility Maximization

I. Introduction

Preference helps people make decisions among alternatives. However, there are circumstances where even known preferences can be of little use. This is referred to as a decision problem. Lichtenstein and Slovic (2006) have classified decision problems into three categories based on the subjects' familiarity with intended topics: 1) when options are unknown or unavailable; 2) when options are known but exhibit conflicting or trading-off characteristics; and 3) when preferences are known but are hard to portray or quantify. Except for the first category, people are often left with difficult choices. Rustichini (2009) has found that preference can be reflected in decision time and decision frequency. Tacit preferences may also exert some influences on a person's decision-making process. For example, Ellsberg (1961) has discovered that aversion to ambiguity can cause people to shy away from alternatives whose probability of occurrence is uncertain. In taking this finding one step forward, Heath and Tversky (1991) notice that the impact of aversion to ambiguity can be alleviated as experience or familiarity accumulates. In addition, preferences might be associated with a person's cognitive ability, degree of risk aversion, decision time, and patience (Benjamin et al., 2007; Dohmen et al., 2007; and Peters et al., 2006).

This research focuses on the second and third categories introduced by Lichtenstein and Slovic. These decision problems may include choices made in regard to new products, a new job, or moving into a new environment. People usually rely on past experience or recallable events in making such decisions (Bettman, Luce, and Payne, 1998). It takes experience to discern which information to pay attention to. For example, transportation may play a role in deciding whether to accept a job offer. A proposal to move near a train station often suggests not only convenience, but also noise. Hsee (1993) demonstrates that more weight will be put on familiar characteristics when making new decisions of this kind. People tend to choose alternatives with positive reminiscences and walk away from those with negative ones.

Since research has shown that experiences influence preference in an indirect manner (Ariely and Norton, 2007), this paper assumes that people do not make random decisions when facing unfamiliar decision problems. Rather, decisions are made based on past experience. In addition, this paper intends to elicit preference information by asking subjects to choose among products that display distinctive characteristics. Abundant evidence has supported the view that personality may have an impact on behavior (Brody and Cunningham, 1968; Kraaykamp and von Eijck, 2005; Chamorro-Premuzic et al., 2005). In order to explore the relationship between personality and preference, this paper also assumes that individual preference is heterogeneous and that subjects favor money over products of equal value.

A typical market survey investigates consumer preferences by examining ratings assigned to a variety of products. However, such survey results may be loosely tied to a subject's real-life behavior. In real life, it is likely that a subject turns back to purchase products he or she ranked low in a survey. To prevent this kind of inconsistency, this study uses cash to establish an upper limit of product value to motivate subjects to make prudent decisions in response. We follow the upgrade method and incentive-aligned design created by Professor Ming Ding at Pennsylvania State University. In particular, participants in our experiment have a chance to win their dream product together with cash with a total value of TWD 10,000.

It should be noted that this paper does not discuss the subjects' experience brought about by the selection of the new products. Studies have shown that consumers are not good at gauging their true preferences, which could be attributed to biases from affective forecasting

error (Loewenstein and Schkade, 1999), the endowment effect (Loewenstein and Adler, 1995), and miswanting (Gilbert and Wilson, 2006), to name a few. It is not uncommon for a product to be purchased first before a consumer understands his or her true preference. As a consequence, subjects may not repeat prior choice when placed in identical situations. Due to budget constraints, it is impractical to monitor the status and feedback of each subject. In addition to existing preferences, decisions may also be impacted by a person's own memory, behavior, and surroundings (Ariely and Norton, 2007). Preferences change over time, posing difficulty to multi-stage observations. Lastly, the people sampled in this study are mainly college students. Sample characteristics (i.e., the results of the personality test) will be compared with those of large-scale sampling conducted in the past. The methods, experimental designs, and results of this study will be discussed in the following sections.

II. Methods

Consumption theory assumes that consumer preference exhibits some well-behaved properties; the optimal bundle is determined after plugging in endowment and price constraints. Preferences and constraints together define behaviors. That said, consumers' behaviors cannot be explained before preferences are known. Preferences are unfortunately hard to describe. This has created a problem for marketing professionals. In the 1970s, conjoint analysis emerged to analyze consumer needs by looking at product attributes. A variety of product attributes and their respective levels were combined arbitrarily for consumers to choose from. Statistical methods were then applied to infer preferences; these methods (which will be introduced later) include: decomposition, composition, hybrid (e.g., self-explicated) conjoint analysis, and adaptive conjoint analysis.

The idea of conjoint analysis was first found in Luce (a mathematician and psychologist) and Tukey's (a statistician) conjoint measurement in 1964. Since its introduction to Marketing by Green and Rao in the 1970s, conjoint analysis has become a mainstream method to measure consumer preference (Green and Rao, 1971; Johnson, 1974; Srinivasan and Schocker, 1973). Green and Srinivasan's study of conjoint analysis in 1978 has been extensively developed (Wittink and Cattin, 1989; Carroll and Green, 1995; Green and Krieger, 1991; Mahajan, Green, and Goldberg, 1982). According to Green and Srinivasan (1990), approximately 400 business applications are developed each year; among which 60 percent account for consumer products. These applications include the evaluation of new product/ideas, product positioning, as well as the analysis of market competition, pricing strategies, and market segregation. Questionnaires are used to collect raw data. Collected data (i.e., rating scales or rank orders) are then used to estimate the respective part-worth, using the least-squares method. This process is called the full-profile method (Green and Srinivasan, 1978).

With the progress of technology and the advancement of products, product attributes and their respective levels have increased tremendously, challenging the use of conjoint analysis (Bradlow, 2005). In response, the self-explicated method, hybrid conjoint analysis, and adaptive conjoint analysis provide some complementary solutions (Green, 1984). The self-explicated method measures a subject's preferred level of a certain product attribute. For example, subjects may be required to mark their level of satisfaction with regard to the megapixels (2.0, 3.0, 5.0, and 8.0) of digital cameras on a scale of one (least satisfied) to ten (most satisfied). After the preferred level of an attribute has been determined, subjects are then requested to assign a weight to this attribute (the weight sums to one for all attributes).

There are four common attributes to consider in buying a digital camera: the level of pixels, screen size, memory size, and quality of the lens.

Taking the self-explicated method forward, hybrid conjoint analysis divides subjects into groups based on self-explicated preferred levels so as to reduce the workload resulting from too many attributes. However, estimates generated in this way risk the loss of the whole picture of consumer preference. As a consequence, Huber (1987) is of the opinion that compositional methods that consider attributes, levels, and subjective weights can better reflect population preference.

Obviously, each method has its strengths and weaknesses. The self-explicated method overlooks the correlation between product attributes and asks participants to make a *ceteris paribus* decision. Hsee et al. (1999) find that there are circumstances whereby joint evaluation and separate evaluation could generate different outcomes and preference reversals may occur. Sattler and Hensel-Borner (2000) further point out the restrictions faced by the self-explicated method, which include 1) non-linear product attributes; 2) social impacts; and 3) unaligned participant interests. One way to neutralize the impacts brought about by the last restriction is to use the incentive-aligned upgrading method.

In this research, both the self-explicated method and the upgrading method are used to unveil the relationship between consumer personality and the process of utility maximization. This study also uses conjoint analysis to verify if the previous results are robust.

III. Experiment

All participants were students at Tamkang University in Taiwan.[1] A sample of one hundred students (41 female and 59 male) were selected to investigate preference toward consumer electronic products. Data were collected using Lai's Personality Inventory and a behavioral experiment introduced later.

3.1 Lai's Personality Inventory

Borrowing the ideas of Guilford (1940), Guilford and Martin (1943), and Guilford and Zimmerman (1948), Lai (1986) designed the first twelve scales of Lai's Personality Inventory. The thirteenth scale comes from the Minnesota Multiphasic Personality Inventory, measuring honesty with ten questions. In 2003, two other characteristics scales were included and Lai's Personality Inventory was thus expanded to fifteen scales. Each of the fifteen scales has ten questions, bringing the total to 150 questions. The fifteen scales are general activity (G), ascendancy (A), social extraversion (S), thinking extraversion (T), rhathymia (R), cyclic tendency (C), inferiority feeling (I), nervousness (N), strain (ST), anxiety (AN), depression (D), objectivity (O), cooperativeness (CO), aggressiveness (AG), and lie (L). These scales measure the intensity of characteristics that are defined as follows:

- General activity (G): fond of activities, determined, fast-paced, energetic, and persevering;
- Ascendancy (A): leading character in a group, calm, commanding, and proactive;
- Social extraversion (S): sociable, outgoing, and fond of making contact with people;
- Thinking extraversion (T): inconsiderate, direct, reckless, and imprudent;
- Rhathymia (R): thinking positively, optimistic, and easily adapting to the environment;

[1] We recruited a total of 85 undergraduate and 15 graduate students.

- Cyclic tendency: impetuous, sensitive, and emotional;
- Inferiority feeling (I): lack of confidence and easily influenced;
- Nervousness (N): easily overreacting, short-tempered, and sentimental;
- Strain (ST): worried, anxious, and apprehensive;
- Anxiety (AN): less concentrated, fatigued, depressed, and uneasy;
- Depression (D): pessimistic, thinking negatively, gloomy, and dejected;
- Objectivity (O): less willing to take advice, feeling insecure, with enormous ego, stubborn, and discontent;
- Cooperativeness (CO): uncooperative, fastidious, uncompromising, and feeling disrespected;
- Aggressiveness (AG): self-oriented, ambitious, headstrong, resistant, unfriendly, and hostile;
- Lie (L): insincere and sometimes lying to hide his or her own weakness.

G, A, S, T, and R collectively measure the degree of *extraversion*; C, I, and N are inclined to the state of being *emotionally unstable*; ST, AN, and D imply the level of being *mentally ill*; and O, CO, and AG examine the ease of being *socially adaptive* (Lai and Lai, 2003).

3.2 Participants

[Insert Table 1 and 2 here]

The row above the table marks the distribution of Lai's norm with distinctive colors. [2] Ordered outcomes of the participants' personality test are presented in like colors for comparison with the norm. From left to right, the colored areas represent the percentile ranges of "0-10th ", "10th -30th ", "30th – 70th", "70th – 90th ", and "90th – 100th ", respectively. It can be seen from Table 1 and Table 2 that our sampled outcomes behave differently from the norms. Some of the results for the female sample are lower than the norms (i.e., G, A, S, T, C, N, AN, O, CO, and AG), while some are higher (R, ST, and L). For male students, the sampled outcomes scored lower in T, C, I, ST, AN, O, and AG, while scoring higher in G, A, S, R, and L. These results suggest that those females in our sample exhibit introversion, have a positive mindset, are emotionally stable and are well-adapted to society. Those in the male sample exhibit extraversion, are emotionally stable, are mentally healthy, and are well-adapted to society. In addition to observation, the Kolmogorov-Smirnov test for two populations is used. It should be noted that at a five percent level of significance, our sample does not significantly differ from the 2003 norm outcomes except for the ST, O, and L scales for our male sample and the O and L scales for our female sample.

A standard Lai's Personality Inventory test does not impose any limit in terms of response time. However, for this experiment, participants were given 40 minutes for all the 150 questions, excluding the time for the introduction, explanation, and tabulation. This activity took about 80 minutes in total, followed by a 10-minute break. Participants were then required to participate in our behavioral experiment for product preferences. We spent about 20 minutes explaining the process of the experiment, the product attributes, and the levels to ensure that participants were informed of all the rules. During the experiment, each participant was equipped with a computer and no time restriction was imposed. Most

[2] Lai and Lai (2003) sampled 1,563 male and 1,625 female undergraduate students in Taiwan to form a norm distribution for male and female students.

participants finished the test within 70 minutes. The total time spent on these two activities amounted to 180 minutes, including the break.

IV. Self-explicated Preference, Conjoint Analysis, and Upgrading Experiment

[Insert Table 3 here]

This experiment was designed to elicit from participants their built-in cost and benefit analysis, after plugging in the cash incentive. Computer-based tests were used to discover a participant's self-explicated preference (i.e., reported subjective preferred product structure), to corroborate revealed preference with conjoint analysis (i.e., interaction with participants), and then to carry out the upgrading experiment (i.e., by letting subjects create their ideal product attributes and levels).

4.1 Preference Elicitation

As can be seen from Table 3, each product has three attributes, which in turn can be separated into four different levels. Thus, each of the three products can be represented by 4x4x4= 64 combinations. In addition, participants are given a chance to add back a product function not selected in the first round. The additional function can also be broken down to three levels so that the total number of combinations for the three products would amount to 64x2x4x3=1,536, which would require too much work and time for participants to rank in order. Therefore, for the conjoint analysis, participants are asked to rearrange only 16 out of 64 combinations for each product based on their preferences. The 16 key combinations were selected with SPSS's Orthogonal Design. The full-profile of sample preference can be found by using the least-squares method. We then used the self-explicated method and upgrading method to analyze the added product function.

4.2 Upgrading Method

Stage 1: Participants are requested to select one out of three products they desire most.

- Both product attributes and their respective levels are known. In addition, each participant is granted 10,000 of token value.
- After selecting their desired product, participants are given a chance to upgrade/downgrade each of the three product attributes to a different level.
- Participants are then instructed to reveal their willingness to pay ("WTP") for the product selected and upgraded/downgraded. These are the bid prices.
- Cutoff prices are generated randomly (by computer). If WTP $\geqq$ cutoff price, the upgrading/downgrading becomes successful. Otherwise, the selected product will remain at its original attribute levels (Becker, DeGroot, and Marschak, 1964). We call this process the BDM method.

Stage 2: Participants are given a chance to add one of the two product functions they did not select in Stage 1 and upgrade/downgrade the desired attributes. A successful upgrading/downgrading is again determined by the BDM method introduced in Stage 1.

V. Results

1. Behavioral Indicators

We developed several indicators to evaluate the connection between personality and behavior. These indicators are introduced in the order of the experiment.

1) Consistency (γ): Lai's Personality Inventory contains a few questions that frame an identical situation in an opposite manner (i.e., positive or negative). The consistency ratio is derived based on the subjects' response to questions of this kind.

2) Product familiarity (α): In our questionnaire, participants are directed to provide the number of consumer electronic products they have once possessed for each type of surveyed product (i.e., MP, DC, and PDA). The participants' responses are then compared with the upgrading process. Let $s_{i,r}$ =1 indicate that product *i* has been chosen in the r^{th} stage of upgrading.
$\alpha = \sum_{i=1}^{3} \sum_{r=1}^{2} s_{i,r} \times q_i$, where *i* = 1, 2, 3 refers to MP, DC, PDA.

3) Stage 1 Product (σ): Products selected in Stage 1 are differentiated according to the level of complexity in the production process.
σ = 1, for MP; σ = 2, for DC; and σ = 3, for PDA

4) Number of Upgrades (v): Participants are granted a chance to upgrade each of the three product attributes in Stage 1 and another chance to add an additional function to the existing product, which makes the total number of possible upgrades 4, that is, v= 0,...,4.

5) Degree of Cash Preference (λ): Based on a subject's self-explicated preference, the gap between the upgraded product and the subject's ideal product can be measured. In general, the higher the attribute level, the more a subject likes the product, but this also implies a higher cost of production that may translate into a higher commodity price as well. The initial utility value associated with product *i* is described by
$u_t = \sum_{j=1}^{3} \omega_{i,j} \times \mu_{i,j,k}$, where $k = l_{i,t}$. $\omega_{i,j}$ denotes the initial weight that a subject assigned to product *i*'s attribute *j* by the self-explicated method, and $\sum_{j=1}^{3} \omega_{i,j} = 100, \forall i$.
$\mu_{i,j,k} \in [1,10]$ describes a subject's reported level of satisfaction toward the combination of product *i*, attribute *j*, and level *k*. $k = l_{i,t}$ denotes the level of product *i's* attribute selected by a subject at time *t*.

$\lambda = \sum_{j=1}^{3} \eta_j$, where $\eta_j = 1$, if $\mu_{i,j,l_{i,1}} < \mu_{i,j,l_{i,0}}$, $i = i^*$, where *i** is the product selected for upgrading in Stage 1.

6) Utility Improvement from Stage 1 Upgrading (δ_1^{SE}): Through the subject's self-explicated preference, the utility improvement from the Stage 1 upgrading can be represented by $\delta_1^{\text{SE}} = u_1 - u_0$.

7) Utility Improvement from Stage 1 Upgrading (δ_1^{CA}): Following the conjoint analysis, the utility associated with the diverse level of product attributes can be obtained. Therefore, the utility improvement from the Stage 1 upgrading can also be represented by $\delta_1^{CA} = u_1^{CA} - u_0^{CA}$.
8) Desire for Additional Attribute (κ): At Stage 2, the participants are given a chance to add an additional product function (attribute). In order to maintain a total weight of 100, the weight assigned to the original three attributes needs to be recalculated. κ denotes the number of original attributes whose weights decrease according to the new weighting scheme.

9) Utility Improvement from Stage 2 Upgrading (δ_2): $\delta_2 = u_2 - u_1$.

[Insert Table 4 about here]

2. Results

Table 4 shows the regression results of behavior and personality with the sample of a hundred students collected in previous experiments. *Consistency* is positively influenced by R (rhathymia) and negatively influenced by D (depression). Optimism and a positive mindset seem to imply intact decision-making capability. *Product Familiarity* is negatively influenced by S (social extraversion). The more socially isolated a person is, the less information he or she has, and the more likely it is that the consumer will choose familiar products. The stage 1 product is negatively influenced by R (rhathymia) and I (inferiority feeling). Consumers who feel inferior or used to stay in a comfort zone tend to favor simple products. *Number of Upgrading* is positively influenced by D (depression). Depressed consumers are less content with a given product and take chances wherever they can in upgrading. *Degree of Cash Preference* has less to do with personalities, except for C (cyclic tendency). However, the intercept is positive and significant. This may suggest that consumers with diverse personalities unanimously show a preference toward cash, except for those who are impetuous. The *Utility Improvement from Stage 1 Upgrading* estimated from the self-explicated method and the conjoint analysis method are essentially the same. They are negatively influenced by T (thinking extraversion) and AN (anxiety), and positively influenced by N (nervousness). *Desire for Additional Attribute* also has a positive intercept and is slightly influenced by I (inferiority feeling). *Utility Improvement from Second Upgrading* is slightly influenced by T (thinking extraversion).

VI. Discussion

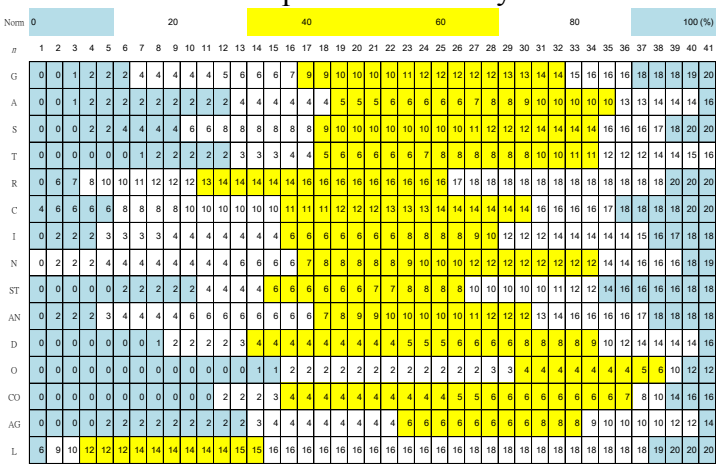
Our results suggest that consumers are capable of more than a simple product search. If technology and the market allow, consumers can locate the product that delivers the highest utility, based on respective interest and the budget constraint. Conventional studies on preference revolve around product quantity, assuming other things equal, while product quantity can be viewed as one of the product attributes that consumers consider in their decision-making process. In other words, consumers have a desired quantity for a specific product if asked to make a *ceteris paribus* decision.

In this study, preference lies in the combination of multiple product attributes and levels. The more attributes consumers can choose from, the higher the utility level consumers can achieve. Currently, neither the composition nor the decomposition method can look beyond existing product attributes. Only through the upgrading method and with a budget constraint

can consumers' unspoken preference be unveiled and understood. Information regarding each consumer's willingness to pay is embedded in the upgrading process. In our experiment, participants are asked to satiate their needs to the best possible extent, while protecting the balance of the token value (which has a chance of being redeemed for cash). In short, this experiment gives power to describe not only the products desired by consumers, but also the prices consumers are willing to pay.

In addition, this study has found that behaviors can be partly explained by the variant degree of emotional stability. Despite its preliminary character, this study explores the relationship between personality and behaviors. Abundant observations of each personality type coupled with in-depth analysis are needed to support or revise the conclusions reached in this study. If information embedded in the preference distribution of product selection can be distilled and matched to certain types of personality, producers may model the exclusively preferred factors of the target buyers in their innovation process. In addition, a leading market trend may stand a better chance of being captured and accurately forecasted once the population personality is known.

Table 1 Participants' Personality- Female



Norm	0															20														40														60														80														100 (%)					
n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41																																					
G	0	0	1	2	2	2	4	4	4	4	4	5	6	6	6	7	9	9	10	10	10	10	11	12	12	12	12	12	13	13	14	14	15	16	16	16	18	18	18	19	20																																					
A	0	0	1	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	5	5	5	6	6	6	6	6	7	8	8	9	10	10	10	10	13	13	14	14	14	16																																					
S	0	0	0	2	2	4	4	4	4	6	6	8	8	8	8	8	8	9	10	10	10	10	10	10	10	10	11	12	12	12	14	14	14	16	16	16	17	18	20	20																																					
T	0	0	0	0	0	0	1	2	2	2	2	3	3	3	4	4	5	6	6	6	6	6	7	8	8	8	8	8	8	10	10	11	11	12	12	12	14	14	15	16																																					
R	0	6	7	8	10	10	11	12	12	12	13	14	14	14	14	14	16	16	16	16	16	16	16	16	16	17	18	18	18	18	18	18	18	18	18	18	18	18	20	20	20																																					
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I	0	2	2	2	3	3	3	3	4	4	4	4	4	4	4	6	6	6	6	6	6	6	8	8	8	8	9	10	12	12	12	14	14	14	14	15	16	17	18	18																																					
N	0	2	2	2	4	4	4	4	4	4	4	4	6	6	6	6	7	8	8	8	8	8	9	10	10	10	12	12	12	12	12	12	12	14	14	16	16	16	18	19																																					
ST	0	0	0	0	0	2	2	2	2	2	4	4	4	4	6	6	6	6	6	6	7	7	8	8	8	8	10	10	10	10	10	11	12	12	14	16	16	16	16	18	18																																					
AN	0	2	2	2	3	4	4	4	4	6	6	6	6	6	6	6	6	7	8	9	9	10	10	10	10	10	11	12	12	12	13	14	16	16	16	16	17	18	18	18	18																																					
D	0	0	0	0	0	0	0	1	2	2	2	2	3	4	4	4	4	4	4	4	4	4	4	5	5	5	6	6	6	6	8	8	8	8	9	10	12	14	14	14	16																																					
O	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	4	4	4	4	4	5	6	10	12	12																																					
CO	0	0	0	0	0	0	0	0	0	0	0	2	2	2	3	4	4	4	4	4	4	4	4	4	4	5	5	6	6	6	6	6	6	6	6	7	8	10	14	16	16																																					
AG	0	0	0	0	2	2	2	2	2	2	2	2	3	4	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	8	8	8	9	10	10	10	12	12	14																																					
L	6	9	10	12	12	12	14	14	14	14	14	14	15	15	16	16	16	16	16	16	16	16	16	16	16	16	18	18	18	18	18	18	18	18	18	18	19	20	20	20																																					

Table 2 Participants' Personality- Male

Norm	0											20											40												60												80											100 (%)
n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59
G	0	0	0	2	2	2	2	4	4	4	5	6	7	7	8	8	8	9	9	10	10	10	10	12	12	12	12	12	12	13	14	14	14	14	14	14	16	16	16	16	16	16	16	16	17	18	18	18	18	18	18	19	20	20	20	20	20	20	20
A	0	0	1	2	2	2	2	2	2	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6	6	8	8	8	8	8	8	8	9	10	10	10	10	10	10	10	12	12	13	13	14	14	14	14	14	15	16	16	16	16	16	18	20	20
S	2	4	4	4	4	5	5	6	6	6	8	8	8	8	8	8	8	10	10	10	10	10	10	10	12	12	12	12	12	12	12	12	12	12	14	14	14	14	14	14	15	15	15	15	16	16	16	16	16	16	17	18	18	18	18	18	18	18	20
T	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	3	4	4	4	4	4	4	6	6	6	6	6	6	6	8	8	8	8	8	8	9	10	10	10	11	12	12	12	12	12	13	14	14	15	16	18	20
R	0	4	6	6	7	8	8	9	9	10	10	11	11	12	12	12	12	12	13	14	14	14	14	14	14	14	15	15	15	15	16	16	16	16	16	16	16	16	17	18	18	18	18	18	18	18	18	18	18	18	19	20	20	20	20	20	20	20	20
C	3	4	4	4	4	4	4	6	6	6	6	6	6	7	7	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	11	12	12	12	12	12	12	12	12	12	14	14	14	14	14	14	14	14	16	16	16	16	16	16	16	17	18	20	20
I	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	3	4	4	4	4	4	4	4	5	6	6	6	6	6	6	6	6	8	8	8	8	8	8	9	9	9	9	10	10	10	11	12	12	12	12	12	13	14	14	16	16	16	19
N	0	0	0	0	0	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6	8	8	8	8	8	8	10	10	10	10	10	10	11	12	12	12	12	12	12	12	14	14	14	14	16	16	16	16	18	18
ST	0	0	0	0	0	0	0	0	0	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	4	4	4	4	4	4	4	4	5	6	6	6	6	6	6	6	6	8	8	8	8	8	8	8	10	10	12	14	14	16	18	18	18	18
AN	0	0	0	0	0	0	0	2	2	2	2	2	2	2	4	4	4	4	4	4	5	6	6	6	6	6	6	6	8	8	8	8	8	8	9	10	10	10	10	11	12	12	12	12	14	14	14	14	14	14	15	16	15	16	17	18	19	20	20
D	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	6	6	6	6	7	7	7	8	8	8	8	9	10	10	10	12	14	16	16	16	20	20	20
O	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	4	4	4	4	4	4	4	4	5	5	5	6	6	6	6	6	6	6	7	8	8	8	10	10	10	10	10	10	16
CO	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	3	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	6	6	6	8	8	8	8	8	8	8	9	9	11	12	12	12	12	14	14
AG	0	0	0	0	1	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	4	4	4	4	4	4	4	4	4	4	5	6	6	6	6	6	6	6	6	8	8	8	8	8	10	10	10	10	10	10	11	11	12	12	12	12	14	14	14
L	2	7	8	12	12	12	12	14	14	14	14	14	14	14	14	14	14	16	16	16	16	16	16	16	16	16	16	17	18	18	18	18	18	18	18	18	18	18	18	18	18	18	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

Table 3 Product Attributes and Levels

P. / Att.	Personal Digital Assistant (PDA)		Digital Camera (DC)		Multimedia Player (MP)	
1	**Networking Type**	3G (WCDMA)	**Megapixels**	2.0	**Support Media Type**	Music
		3.5G (HSDPA)		3.0		Music+Photo
		3.5G,WiFi		5.0		Music+Movie
		3.5G,WiFi, and WiMax		8.0		Support rmvb Media (MP5)
2	**GPS Display**	2D	**Screen Size**	2” and below	**Support Resolution**	N/A
		3D static		2.1”~2.9”		320×240 (VCD)
		3D dynamic		3.0”~3.4”		640×480 (DVD)
		2D + 3D		3.5” and above		1280×720 (HD)
3	**Max. Memory Size**	1G	**Max. Memory Size**	1G	**Max. Memory Size**	1G
		2G		2G		2G
		4G		4G		4G
		8G		8G		8G

Table 4 The Regression Results of Behavior and Personality

	Inter.	Gender	G	A	S	T	R	C	I	N	ST	AN	D	O	CO	AG	L
γ	0.91	1.01	-0.31	-0.79	-0.25	-0.54	6.55 ***	0.4	0.55	-0.77	1.48	0.5	-2.55 **	-0.37	-0.16	-0.89	-0.89
α	1.79 *	-0.3	-0.11	1.31	-2.86 ***	1.37	1	0.03	-1.09	-0.7	0.18	0.88	0.41	-0.19	-0.34	-0.29	0.69
σ	7.56 ***	-0.52	0.23	-0.07	-1.34	0.44	-3.7 ***	-0.89	-2.47 **	-0.58	0.64	0.92	-0.9	0.22	0.61	1.26	-0.09
υ	0.36	0.86	-0.14	-0.34	1	-0.53	1.09	1.65	0.57	0.35	-0.5	-0.73	2.34 **	1.07	0.24	-0.67	-0.55
λ	4.52 ***	-0.66	0.23	-0.11	-0.84	0.86	-1.37	-1.95 *	-0.39	-0.47	0.01	1.2	-1.49	-0.59	-0.91	0.95	0.2
δ_{1SE}	-0.44	-0.48	0.43	0.17	0.92	-2.46 **	1.12	1.92 *	0	2.02 **	0.24	-2.27 **	0.91	1.02	1.19	-1	0.99
δ_{1CA}	-1.23	-0.93	0.19	0.61	0.76	-2.43 **	1.75 *	1.47	0.38	2.09 **	0.29	-2.14 **	1.01	1.27	1.13	-0.52	0.83
κ	2.86 ***	-0.56	0.04	0.06	-0.03	-1.38	-0.12	-0.08	1.84 *	-0.38	-0.34	-0.46	-0.37	0.86	-1.62	1.25	0.98
δ_2	1.88 *	-0.67	-1.44	-0.41	1.07	1.89 *	-0.46	-0.14	0.75	-0.57	-0.04	0.27	-1.11	0.18	-1.32	-0.5	-0.51

Note: *, **, and *** denote significance at the10%, 5%, and 1% levels, respectively.

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