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Abstract

Consumers often anthropomorphize brands by endowing them with personality traits, and marketers often create or reinforce these perceptions by their brand positioning. Brand personality traits provide symbolic meaning or emotional value that can contribute to consumers' brand preferences and can be more enduring than functional attributes. Successfully positioning a brand's personality within a product category requires measurement models that are able to disentangle a brand's unique personality traits from those traits that are common to all brands in the product category. This paper proposes a circumplex model that separates the two by using category–level and brand–level random effects. Circumplex models provide a parsimonious representation of personality traits that are characterized by similarity and polarity among personality domains. These models locate traits around a circle such that neighboring traits in a personality domain are in opposition to domains on the other side of the circle. Unlike factor models, the circumplex explicitly captures tradeoffs among personality domains. In an empirical study of 30 brands in three product categories, we detected considerable evidence that category perceptions contribute to the perceptions of brands within the category. The study found three personality domains:"Suave" and "Sensible" are in opposition on a bipolar dimension, and "Capable" is measured on a unipolar dimension. These personality dimensions are related to antecedents such as interest in the category and familiarity with the brand, and the domains, in turn, are related to the consumer's affect towards the brands.

Brand Management, Brand Personality, Circumplex Correlation, Psychological Measurement, Hierarchical Bayes Models

1 Introduction

Considerable evidence indicates that consumers often think about brands as possessing human-like personality traits (Levy 1959; Aaker 1997), with these traits denoting types of symbolic meaning that contribute to a consumer's preference for one brand over another (McCracken 1986; Aaker 1999). Brands may be perceived not only to possess functional attributes, such as fuel economy for cars, but also to vary in the degree to which they are seen as imaginative, cheerful, or honest. In categories where brand personality influences preferences, optimal positioning strategies should consider the array of traits that the brand embodies, in addition to functional qualities in order to attract targeted consumers. To aid in such targeting, market strategists need to conduct research on perceptions of competitive brand personality imagery within the product category and on brand personality associations that are considered desirable by different consumers. For instance, Aaker (1999) has recently shown that specific brand personality dimensions only have an impact on a consumer's brand preference if those personality traits are schematic (i.e., both descriptive and important) to the consumer's sense of his or her personality or self. Self-schematic traits can be either chronically accessible to the individual or become temporarily accessible because of salient situational cues.

Positioning a brand based on personality traits requires not only measuring the variation of perceptions of that brand across consumers but also disentangling unique brand characteristics from those shared by all brands in the category. The personality of the brand is often hard to separate from that of the category (Lautman 1991, Levy 1959), caused by the transfer of meanings across these two domains. According to Lautman (1991), consumers act as if they have a schemata for categories of products or services. These schemata are clusters of interconnected rational and irrational beliefs, emotions, facts and perceptions, associated in memory. The end-affect associations desired by consumers are often a characteristic of the product category, such as for example "fun" for ice cream (Durgee and Stuart 1987). Domzal and Kernan (1992), based on an analysis of print ads, found that beer ads typically played up the category associations of refreshment and "alive-ness," friendship and

social consumption, a sense of private enjoyment, and communicating status, while liquor ads stressed a sense of solitude and relaxation, extroverted festive celebration, as well as status communication.

These results indicate that strategic brand positioning research requires the separation of brand from category perceptions whenever brand personalities are being analyzed. For example, a brand seen as "cheerful" might not be distinctive among ice-creams, where such perceptions may be intrinsic to the category and be widely-shared, but may be distinctive in a category like automobiles, where the category meaning does not endow all brands with equal amounts of this same quality. Alternatively, the same personality characteristic may contribute differentially to preference across product categories that vary in the salience of this personality characteristic. A brand's personality associations likely acquire meaning and value only when viewed in the context of a particular category, being "figures" necessarily viewed in a category "ground," to use a metaphor from gestalt psychology (Lewin 1951). Further, the same personality descriptor may have idiosyncratic connotations across product categories, with very different consumer-attracting implications. For example, "wholesome" may be interpreted to mean intellectual integrity for magazines but conservative styling for jeans.

Brand personality research to date has been mostly restricted to studies of brands in a single category. However, marketing strategists arguably benefit considerably from personality positioning possibilities in several product categories, to suggest strategies unconventional for the target category, inspired by strategies already used in others. Assessing between–category personality is also needed for brand extensions. For instance, extending a fashion brand label from clothing to toiletries is viable only if the brand personality in the original category enhances perceptions in the target category. Calvin Klein successfully extended its brand to perfumes where its brand association for sophistication is desirable across both categories. Note that Calvin Klein did not attempt an extension to household cleaners, a category that emphasizes a different array of traits than those of luxury or fashion goods. Co–branding, such as Jeep and Levis, Subaru Outback and L. L. Bean, and Ford Explorer

and Eddie Bauer, only makes sense when the brand personalities are compatible: here tough, reliable, and out-of-doors. Such cross-category analysis requires the estimation of category personality maps, separate from those that apply to individual brands.

In conclusion, there exists a need for the development of research methodologies that tease apart product category influences from brand personality perceptions. Such a research methodology would have potential importance for the development of marketing strategy, in particular for advertising and brand image management. Such a methodology is developed here. Section 2 reviews methods for measuring brand personality. Section 3 describes the study used in the empirical analysis. Section 4 presents the random effects, circumplex model for brand and category personality, and Section 5 discusses the results of the study. Section 6 ends with a discussion.

2 Measuring Brand Personality

For purposes of brand image management, brand personality perceptions are often represented in low dimensional spaces through the application of factor models (Park, Jaworski and MacInnes 1986; Fournier 1997). For example, Aaker (1997) applies exploratory factor analysis to identify five brand personality dimensions. In doing so, she follows the early work of Cattell (1946), who used factor analysis to identify human personality dimensions, which later led to the Five Factor Model of personality (e.g. McCrae and John 1992).

Recently, however, evidence has surfaced in the psychology literature showing that interpersonal traits are better represented by a circumplex than by a factor structure (Wiggins, Steiger, and Gaelick, 1981; Meyer and Shack 1989; Saucier 1992). The circumplex describes the relation among personality traits, often associated with expression of emotions, that are characterized by similarity and polarity and implicitly impose conflict between opposing traits (Plutchik and Conte, 1997, p.28). It does so through a two dimensional factor structure in which the factor loadings for the items are constrained to the unit circle. Whereas the circumplex originally only referred to a circular ordering of personality traits, Guttman

(1954) coined the term "circumplex" to describe the correlation pattern implied by it: the elements of the corresponding correlation matrix first decrease but then increase as one moves perpendicular to the main diagonal.

Numerous applications of circumplex models can be found in personality and social psychology (Plutchik and Conte, 1997). Browne (1992) provides an overview of the circumplex model as a nonlinearly constrained confirmatory factor model. Factor and circumplex models of personality trait structure differ most importantly in whether trait projections are distributed uniformly throughout a two-factor space, as in the circumplex, or are tightly clustered near the axes representing the dimensions, as in factor analysis. There is substantial empirical evidence in the psychology literature in favor of the circumplex representation of personality traits (see Gurtman 1997). We conjecture that the circumplex not only is an appropriate model for human personality, but that is well suited to represent brand personality as well.

Against this background, we present a Bayesian formulation of a circumplex model for brand and category personality that differs from previous approaches in important aspects. We introduce an hierarchical specification of the circumplex model that identifies the extent to which brands and categories differ in their representation on the circumplex, models those distinctions as a function of antecedents of brand personality and investigates their effects on overall brand evaluations. We incorporate various antecedents of the effects of brand personality, such as category interest and brand familiarity, since this has been deemed an important avenue for future research by researchers (Aaker 1997, p.354; Batra, Lehmann and Singh, 1993), and model the consequences of brand personality on consequences of brand preference.

We accommodate a number of important issues pertaining to the data collection instrument. We deal with (1) the ordinal nature of the response scales, (2) idiosyncratic response-scale usage that, if not accounted for, may substantially distort the derived circumplex, and (3) structured blocks of missing observations arising due to a split questionnaire design that was developed to alleviate respondent burden, given the large number of questions in brand

personality surveys. We capitalize on the MCMC estimation algorithm to accommodate those issues.

As a result, our approach facilitates tests of psychological theories based on a circumplex structure and controls for a number of nuisance effects. We extend the work by Lenk, Wedel and Bockenholt (2003) by formulating a hierarchical extension of the nested circumplex, dealing with the brand category structures of both the angles and the weights, while reparameterizing the latter in terms of antecedent variables. In addition, we use the individual level parameters describing the circumplex to predict measures of brand preference. The next section describes the brand-category personality data, then we describe the proposed model and the results.

3 Brand-Category Personality Data

Data were collected on brand personality perceptions using a subject pool at a major university in fall 2000. One hundred and nineteen respondents completed the questionnaire. The three categories were Cars, Jeans and Magazines, with ten brands in each category, as shown in Table 1. The three categories were identified based on Ratchford's (1987) think-versus-feel dimensions: symbolic (Jeans), utilitarian (Magazines) and both symbolic and utilitarian (Cars).

A major challenge in developing the questionnaire was its length and the resulting burden for respondents. Assessing a large number of brand personality items for 30 brands presents an insurmountable burden. Two solutions to this problem were adopted. First, a split questionnaire design was used. The questions were split across four groups of respondents, with each respondent evaluating approximately a quarter of the brands for each category. Table 1 shows the numbers of subjects that answered the questions on each of the brands. Two brands, Porsche and Mercedes, were used as common, first-listed "anchors" for all subjects. Second, for each of the brands, brand personality was assessed on only fifteen items selected from Aaker (1997). She derived 5 factors, with a total of 15 facets, and used

Table 1: Brands and Categories (number of subjects in parentheses)

Cars	Jeans	Magazines
1. Porsche (119)	1. Levi's (27)	1. Readers Digest (30)
2. Mercedes (119)	2. Lee (31)	2. Cosmopolitan (28)
3. Lexus (30)	3. Guess? (28)	3. National Geographic (31)
4. Saturn (28)	4. Fubu (29)	4. Time Magazine (30)
5. Chevrolet (29)	5. Polo (29)	5. Money Magazine (27)
6. Pontiac (28)	6. Tommy Hilfiger (32)	6. People Magazine (32)
7. Honda (31)	7. Calvin Klein (28)	7. Parenting Magazine (30)
8. Volvo (29)	8. Gap (29)	8. GQ Magazine (27)
9. Jaguar (30)	9. Diesel (28)	9. Rolling Stone Magazine (27)
10.Volkswagen (28)	10. Abercombe & Fitch (32)	10. Consumer Reports Magazine (27)

multiple (2-3) items for each facet. We used the first (highest loading) item she gave for each of her 15 facets. The items were selected to represent the five personality dimensions identified.

Subjects responded to the personality items on a 9-point, ordinal scale with one anchored with "[brand] is not at all like this [personality item]" and 9 described as "[brand] is very much like this [personality item]." The items and their means for each of the categories are shown in Table 2, where they are grouped by Aaker's five personality domains. Looking within categories, Cars are rated highest on Reliable and lowest for Out-of-Doors; Jeans are rated highest on Up-to-Date and lowest on Charming; and Magazines are rated highest on Up-to-Date and lowest on Out-of-Doors. This between-category dispersion in mean ratings provides prima facie evidence that personality varies across categories.

Two category–level and two brand–level antecedents to brand personality were assessed. The category–level variables are Interest in the category ("very low" to "very high") and whether or not the choice of a particular brand in the category reflects a person's Image ("says nothing about a person" to "says a lot about a person"). In Table 2, Cars scored the highest on both Interest and Image. Magazines had the lowest average Interest, and Jeans had the lowest average Image. The brand–level variables are Familiarity ("very unfamiliar"

Table 2: Item Responses on 9 Point Scales Averaged over Brands in Categories

Personality Domain	Item	Cars	Jeans	Magazines
Sincerity	Down-to-Earth	5.68	5.12	5.69
	Honest	6.08	5.17	6.12
	Wholesome	5.87	5.13	5.72
	Cheerful	5.57	5.19	5.38
Excitement	Daring	4.92	5.04	5.24
	Spirited	5.68	5.51	5.78
	Imaginative	5.56	5.27	5.94
	Up-to-Date	6.60	6.20	7.67
Competence	Reliable	6.85	6.14	6.78
	Intelligent	6.48	5.24	6.76
	Successful	6.50	5.64	7.02
Sophistication	Upper-Class	5.98	5.39	6.08
	Charming	5.46	4.82	4.85
Ruggedness	Out-of-Doors	3.94	4.87	3.50
	Tough	4.24	5.24	3.62
Category Measures	Interest	6.73	6.34	5.77
	Image	7.68	6.37	6.58
Brand Measures	Familiarity	6.38	5.92	5.70
	Relationship	4.26	3.91	3.96
	Quality	6.87	5.97	6.43
	Feeling	6.24	5.20	5.77

to "very familiar") with the brand and the strength of the subject's Relation ("very weak" to "very strong") to the brand. Averaged across brands, Cars had the highest scores for these variables, while Magazines had the lowest Familiarity, and Jeans had a slightly lower score for Relation than Magazines. An outcome variable, the subject's overall Feelings ("very negative" to "very positive") towards the brand is predicted from the brand personality factor scores and the control covariate, overall Quality ("very low" to "very high"). Averaged across brands, Cars had the highest Quality and Feeling and Jeans the lowest.

Table 3 reports the mean of the brand–level measures, sorted within category by the outcome variable Feeling. Within their categories, subjects' had the lowest affect for Pontiac, Fubu, and Parenting, and the highest affect for Jaguar, Polo, and Time. The ordering of brands on the other variables closely matches that for Feeling. Aggregating the categories, Spearman's rank correlations with Feeling are 0.69 for Familiarity, 0.68 for Relation, and 0.87 for Quality. In aggregate, the more involved subjects are with a brand, the higher they evaluate it. The large rank correlation between Quality and Feeling is partially a halo effect. We will see that after adjusting for Quality, brand personality still impacts Feeling.

4 The Hierarchical Circumplex Model

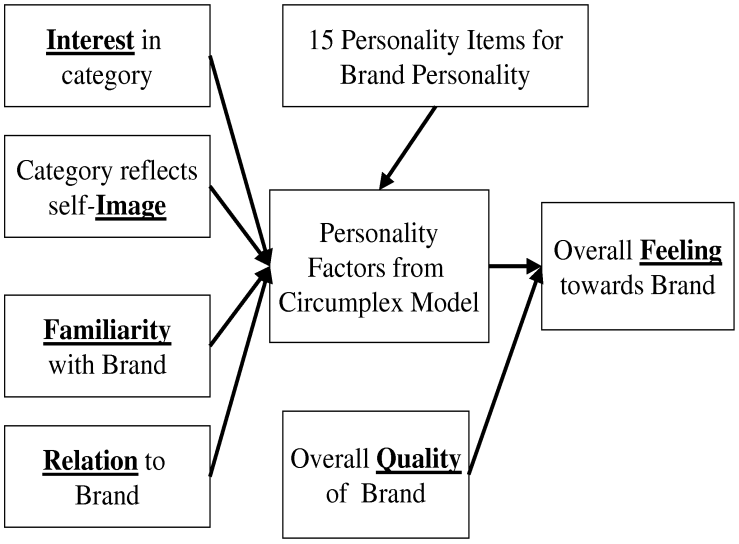
The model for this paper consists of four parts. First, all observed variables are ordinal, and we use a cut-point model (Congdon 2001, p. 154) to relate the ordinal data to underlying, continuous, latent variables. The cut-point model assumes that the subject's ordinal response occurs if the continuous latent variable falls between two, consecutive cut-points. Each subject has his or her set of cut-points that are used for all survey items. This model effectively accounts for subjects' scale usage and can accommodate ordinal data that is highly skewed or multi-modal. Rossi, Gilula, and Allenby (2001) demonstrate that cut-point models effectively accommodate scale-usage heterogeneity.

Second, the continuous latent variable for the brand personality items follows a two factor model where the factor loadings are constrained to be on the unit circle. This constraint

Table 3: Mean Evaluations for Brand Measures

	Familiarity	Relation	Quality	Feeling
PONTIAC	5.71	4.16	5.09	4.65
SATURN	5.82	3.45	5.60	4.81
CHEVROLET	6.46	4.31	5.42	5.08
HONDA	6.50	4.81	6.31	5.87
VOLVO	6.07	4.07	7.08	6.06
VW	6.01	4.12	6.47	6.08
LEXUS	6.99	4.44	8.08	7.33
PORSCHE	6.61	4.19	8.29	7.47
MERCEDES	6.88	4.55	8.33	7.50
JAGUAR	6.75	4.45	7.98	7.52
FUBU	3.79	1.85	4.40	3.15
LEE	4.74	2.53	4.61	3.67
TOMMY HILFIGER	5.85	3.71	5.80	4.72
A&F	6.66	4.47	5.92	5.31
GUESS?	5.89	3.68	6.36	5.39
LEVI'S	6.79	4.37	6.24	5.57
DIESEL	5.25	3.75	6.55	5.79
CALVIN KLEIN	6.34	4.34	6.51	5.97
GAP	7.15	5.78	6.45	6.16
POLO	6.71	4.59	6.82	6.24
PARENTING	3.21	1.94	5.69	4.60
READER'S DIGEST	5.07	3.02	6.28	5.14
COSMOPOLITAN	5.70	4.03	5.64	5.47
CONSUMER REPORTS	5.54	3.74	6.94	5.80
NATIONAL GEOGRAPHIC	5.91	4.01	7.21	5.93
GQ	5.99	4.18	6.37	5.97
PEOPLE	7.08	5.12	5.75	5.97
ROLLING STONE	6.17	4.21	6.38	6.07
MONEY	5.37	4.08	6.99	6.14
TIME	6.96	5.28	7.03	6.63

Figure 1: Structural Model for Brand Personality



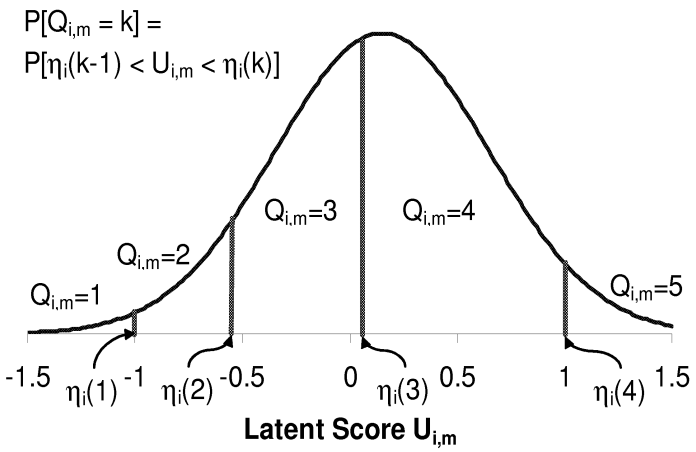
induces the circumplex correlation structure whereby personality items are ordered according their correlations. The factor scores are decomposed into between–category, within–category, and brand random effects. Third, the latent factor scores from the circumplex model for brand personality are related to antecedents. Interest and Image are category personality antecedents, and Familiarity and Relation are brand personality antecedents. A technical challenge is to introduce antecedents while preserving the circumplex structure. Fourth, brand Feeling, a measure of preference, is a outcome variable of the personality factors, and Quality is a control variable. Figure 1 summarizes the structural model for the data. The model components are described in detail next.

4.1 Cut-Point Model

The cut-point model relates the ordinal responses to an underlying, normally distributed random variable. Figure 2 illustrates the cut-point model for an ordinal item measured on a five-point scale. In this study, all questions were assessed on a nine point scale. $Q_{i,m}$ is the

ordinal response for subject i to question or item m. There are n subjects in the study and a total of M items. The index m will be used here in a generic sense. In the following sections, we will index the items to reflect the structure of the data. For example, personality items are crossed with brands, which are nested within product categories.

Figure 2: Cut-point Model for an Ordinal Item on a Five–Point Scale



The cut-point model assumes that subject i selects scale point k for item m if a latent variable $U_{i,m}$ falls between two consecutive cut-points $\eta_i(k-1) < \eta_i(k)$:

$$Q_{i,m} = k \text{ if and only if } \eta_i(k-1) < U_{i,m} < \eta_i(k) \tag{1}$$

where there are K categories; the cut-points are specific to the subject; and

$$\begin{aligned} \eta_i(0) &= -\infty \text{ and } \eta_i(1) = -1 \\ \eta_i(k-1) &< \eta_i(k) \text{ for } k = 2, \ldots, K-1, \\ \eta_i(K-1) &= 1 \text{ and } \eta_i(K) = \infty \end{aligned}$$

To identify the model, $\eta_i(1) = -1$ and $\eta_i(K-1) = 1$, so there are $K-3$ unknown cut-points per subject, and these are estimated from the data. The distribution of the ordinal data is

derived from the latent variable and the cut-points:

$$\begin{aligned} P[Q_{i,m} = k] &= P[\eta_i(k-1) < U_{i,m} < \eta_i(k)] \text{ for } k = 1, \ldots, K \\ &= \int_{\eta_i(k-1)}^{\eta_i(k)} dF_{i,m}(u) \end{aligned}$$

where $F_{i,m}$ is the distribution of $U_{i,m}$, which is taken to be the normal distribution in this paper.

The model for $U_{i,m}$ is:

$$U_{i,m} = \phi_i + \mu_m + V_{i,m} \tag{2}$$

where ϕ_i is a random effect that accounts for scale usage. The random effects are assumed to arise as a random sample from a normal distribution with standard deviation τ.[2] The mean of $U_{i,m}$ over subjects for item m is μ_m. The random term $V_{i,m}$ is normally distributed with mean zero and will be represented by various model components, depending on the item. These random terms are independent across subjects but correlated within subjects. Because the cut-points and scale usage effects are specific to a subject, this model accommodates a wide variety of distributions for ordinal data, including skewed and bimodal. The next subsection provides the circumplex model for $V_{i,m}$ for personality items, and the following subsection gives the model for the dependent variable.

4.2 Circumplex Model for Brand Personality

There are B brands in each of the C categories. Brands within a category will be indexed sequentially from 1 to B. In our study, brands are unique to their product categories, and we will use "$b|c$" to specify that brand b is nested in product category c. Subjects respond to $J = 15$ personality items for subsets of the brands in the three categories. The circumplex model is a constrained, two-factor model. The model for the latent variable $V_{i,m}$ in Equation

[2]These scale usage effects are subject specific, and we will assume that the same effect applies to all ordinal responses in our data. We did fit a model with brand–specific scale usage random effects and found that the estimated parameters for the two models were similar and that fit statistics indicated the smaller model performed as well as the larger one.

(2) for subject i, personality item j, and brand b nested in category c is:

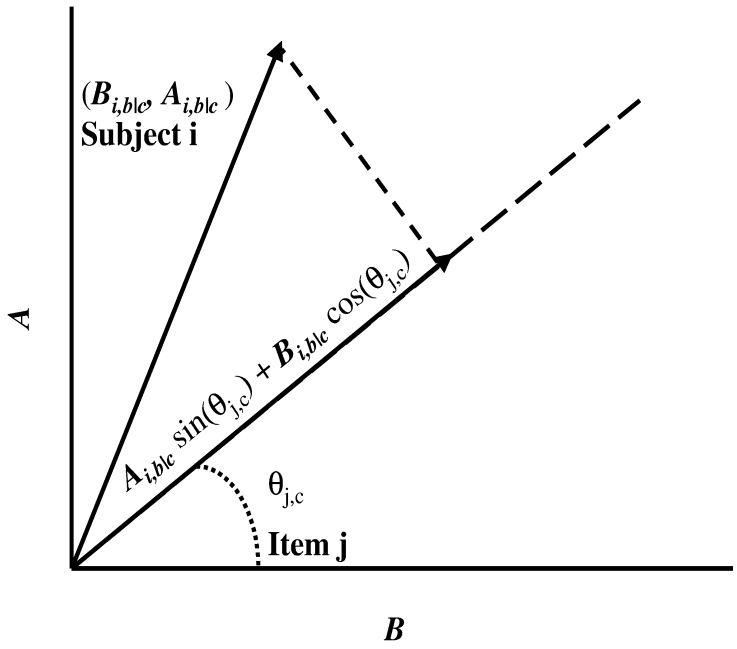
$$V_{i,j,b|c} = \mathcal{A}_{i,b|c} \sin(\theta_{j,c}) + \mathcal{B}_{i,b|c} \cos(\theta_{j,c}) + \epsilon_{i,j,b|c}.$$

The error terms $\{\epsilon_{i,j,b|c}\}$ are mutually independent, normally distributed with mean 0 and standard deviation $\sigma_{j,b|c}$. The latent factor scores $\{\mathcal{A}_{i,b|c}, \mathcal{B}_{i,b|c}\}$ are subject specific and are from a normal distributions with mean zero. The correlation between $\mathcal{A}_{i,b|c}$ and $\mathcal{B}_{i,b|c}$ is zero; however, they are correlated across brands and categories. Their variance and covariance structure will be described below. The factor loadings $\sin(\theta_{j,c})$ and $\cos(\theta_{j,c})$ for each personality item and category are constrained to the unit circle, which induces the circular correlation or circumplex structure. Because of this constraint, the loadings are expressed in polar coordinates and reparameterized in terms of angles $\theta_{j,c}$ which range from zero to 2π. The polar coordinate representation is not unique with respect to rotations. The model can be identified by setting $\theta_{1,c} = 0$ and $0 < \theta_{2,c} < \pi/2$. We will see below that the angles for personality items determine their correlations.

There is one angle $\theta_{j,c}$ for each personality item within a category, and each category has a unique set of angles, which allows for different interpretations of personality items across categories. This formulation thus extends the original work of Aaker (1997), since there the personality structure in terms of the factor loadings is assumed invariant across categories. For example in our formulation, "Reliable" may have different connotations for Cars, Jeans, and Magazines. Our formulation allows subjects to assign context (read: product category) specific meanings to the personality items.

The factor scores $\mathcal{A}_{i,b|c}$ and $\mathcal{B}_{i,b|c}$ are scaled to have mean zero and express a subjects relative weighting on two personality dimensions. Figure 3 is a geometrical representation of the circumplex model. Subject i's perceptions of brand b's personality is represented by the vector $(\mathcal{B}_{i,b|c}, \mathcal{A}_{i,b|c})$, and personality item j is represented by the unit vector with angle $\theta_{j,c}$. The orthogonal projection of the subject's brand personality perceptions onto the unit item vector has angle $\theta_{j,c}$ and radius $\mathcal{A}_{i,b|c} \sin(\theta_{j,c}) + \mathcal{B}_{i,b|c} \cos(\theta_{j,c})$. If the subject's vector is within $\pi/2$ of the item's unit vector, then the radius of the projection is positive, and if the absolute difference between the vectors is between $\pi/2$ and $3\pi/2$, the radius of the projection

Figure 3: Circumplex Model



is negative.

We represent the structure of the personality data — brands nested within product categories — through a random components formulation of the factor scores:

$$\mathcal{A}_{i,b|c} = \alpha_i + \alpha_{i,c} + \alpha_{i,b|c} \text{ and } \mathcal{B}_{i,b|c} = \beta_i + \beta_{i,c} + \beta_{i,b|c}.$$

α_i and β_i are between–category random coefficients that reflect common personality traits across the C product categories. $\alpha_{i,c}$ and $\beta_{i,c}$ are within–category random coefficients that reflect a common personality trait for all brands within category c after removing traits common to all product categories. Lastly, $\alpha_{i,b|c}$ and $\beta_{i,b|c}$ reflect personality traits that are specific to the brand b in product category c after adjusting for the between and within–category personality traits. In this way, the model disentangles brand from product category personality. The relative dispersion of the category and brand random coefficients reflects

the extent to which a brand's personality is determined by the product category.

The circumplex model is:

$$V_{i,j,b|c} = (\alpha_i + \alpha_{i,c} + \alpha_{i,b|c}) \sin(\theta_{j,c}) + (\beta_i + \beta_{i,c} + \beta_{i,b|c}) \cos(\theta_{j,c}) + \epsilon_{i,j,b|c}. \tag{3}$$

The random coefficients in Equation (3) are mutually independent and normally distributed with mean of zero and the following standard deviations:

$$\begin{aligned} \text{std}(\alpha_i) &= \text{std}(\beta_i) &&= \lambda \\ \text{std}(\alpha_{i,c}) &= \text{std}(\beta_{i,c}) &&= \lambda_c \\ \text{std}(\alpha_{i,b|c}) &= \text{std}(\beta_{i,b|c}) &&= \lambda_{b|c}. \end{aligned}$$

The standard deviations for α and β are constrained to be equal, which is required to obtain a circumplex structure. Using trigonometric identities, the variances and covariances of the utilities in Equation (2) are:

$$\text{var}(U_{i,j,b|c}) = \tau^2 + \lambda^2 + \lambda_c^2 + \lambda_{b|c}^2 + \sigma_{j,b|c}^2 \tag{4}$$

$$\text{cov}(U_{i,j,b|c}, U_{i,j',b|c}) = \tau^2 + (\lambda^2 + \lambda_c^2 + \lambda_{b|c}^2) \cos[\theta_{j,c} - \theta_{j',c}] \text{ for } j \neq j' \tag{5}$$

$$\text{cov}(U_{i,j,b|c}, U_{i,j',b'|c}) = \tau^2 + (\lambda^2 + \lambda_c^2) \cos[\theta_{j,c} - \theta_{j',c}] \text{ and } b \neq b' \tag{6}$$

$$\text{cov}(U_{i,j,b|c}, U_{i,j',b'|c'}) = \tau^2 + \lambda^2 \cos[\theta_{j,c} - \theta_{j',c'}] \text{ and } c \neq c'. \tag{7}$$

In the above equations, τ is the standard deviation of the random, scale usage effect ϕ_i. In Equation (4), $\sigma_{j,b|c}$ is the error standard deviation. Equation (5) is the covariance for different personality items j and j' for the same brand; Equation (6) is the covariance for two personality items of different brands b and b' in the same category; and Equation (7) is the covariance for two personality item of brands in different categories c and c'. In the absence of scale-usage effects, $\tau = 0$, the covariances would vary from plus one, to minus one, and back to plus one as the difference in personality angles varies from 0 to π to 2π. This results in the distinctive circumplex correlation pattern where, after properly ordering the items, the correlations first decrease then increase as one moves away from the diagonal of the correlation matrix.

4.3 Antecedents of Brand Personality Random Coefficients

The components of brand and category personality may be determined by concomitant variables. In this study, category Interest and Image are considered antecedents for the category-level random effects $\{\alpha_{i,c}, \beta_{i,c}\}$, and brand Familiarity and Relationship are considered antecedents to brand-level random effects $\{\alpha_{i,b|c}, \beta_{i,b|c}\}$.[3] These antecedents will be included in the model via a regression specification. The technically challenging aspect of including antecedents is to preserve the circumplex structure, which requires the random, personality coefficients to have the same variance and to be uncorrelated. To simplify the presentation we will use a generic subscript h to denote the person, category, or brand factors by substituting null, c, or $b|c$, respectively, for h. For example "$\alpha_{i,h}$" means "α_i" for person effect, "$\alpha_{i,c}$" for category effect, and "$\alpha_{i,b|c}$" for brand effect. $x_{i,h}$ denotes a vector of antecedents for $\alpha_{i,h}$ and $\beta_{i,h}$, and X_h denotes the corresponding design matrix with $x'_{i,h}$ in row i, for $i = 1, \ldots, n$. We assume that the antecedents have been mean-centered, because the brand personality random components also have mean zero.

The regression model components are:

$$\alpha_{i,h} = \lambda_h(x'_{i,h}\xi_{\alpha,h} + \delta_{i,\alpha,h}) \tag{8}$$

$$\beta_{i,h} = \lambda_h(x'_{i,h}\xi_{\beta,h} + \delta_{i,\beta,h}) \tag{9}$$

$$\text{for } i = 1, \ldots, n; \text{ and } h = \text{ null, } c, \text{ or } b|c.$$

The error terms are random samples from normal distributions with

$$\text{std}(\delta_{i,\alpha,h}) = \nu_{\alpha,h} \text{ and } \text{std}(\delta_{i,\beta,h}) = \nu_{\beta,h}.$$

To maintain the circumplex structure, $\alpha_{i,h}$ and $\beta_{i,h}$ have equal unconditional standard deviations and are uncorrelated. Because the means are zero (X_h is mean centered), the in-sample

[3] In the study subject-level antecedents were not assessed, but, if available they could be included in the model.

variances are:

$$\begin{aligned} n^{-1}E\left[\sum_{i=1}^{n}\alpha_{i,h}^2\right] &= \lambda_h^2\left(n^{-1}\xi_{\alpha,h}'X_h'X_h\xi_{\alpha,h}+\nu_{\alpha,h}^2\right) \\ n^{-1}E\left[\sum_{i=1}^{n}\beta_{i,h}^2\right] &= \lambda_h^2\left(n^{-1}\xi_{\beta,h}'X_h'X_h\xi_{\beta,h}+\nu_{\beta,h}^2\right). \end{aligned}$$

One way to obtain equal variances, λ_h^2, is to set:

$$n^{-1}\xi_{\alpha,h}'X_h'X_h\xi_{\alpha,h}+\nu_{\alpha,h}^2 = n^{-1}\xi_{\beta,h}'X_h'X_h\xi_{\beta,h}+\nu_{\beta,h}^2 = 1, \tag{10}$$

which results in the common, unconditional standard deviation λ_h. With this constraint, the error standard deviations ν are less than or equal to one. The in-sample covariance between $\alpha_{i,h}$ and $\beta_{i,h}$ is:

$$n^{-1}E\left[\sum_{i=1}^{n}\alpha_{i,h}\beta_{i,h}\right] = \lambda_h^2\left(n^{-1}\xi_{\alpha,h}'X_h'X_h\xi_{\beta,h}\right).$$

Setting this equal to zero implies a second constraint on the coefficients:

$$n^{-1}\xi_{\alpha,h}X_h'X_h\xi_{\beta,h} = 0. \tag{11}$$

In summary, to preserve the circumplex structure when the personality factors have antecedents, the regression coefficients and error variances should satisfy the conditions in Equation (10) and (11).

When personality factors do not have antecedents, the design matrix is null, and the regression models (8) and (9) simplify to:

$$\alpha_{i,h} = \lambda_h\delta_{i,\alpha,h} \text{ and } \beta_{i,h} = \lambda_h\delta_{i,\beta,h}$$

where restriction (10) implies that

$$\text{std}(\delta_{i,\alpha,h}) = \text{std}(\delta_{i,\beta,h}) = 1.$$

In other words, the special case is the standard model for random effects.

The antecedents in this survey are items measured on a nine–point ordinal scale. The cut-point model was used for these antecedents as well, and the latent variable $V_{i,m}$ in

Equation (2) was used as the independent variables in the model for brand personality. By construction, $V_{i,m}$ is normally distributed with mean zero. Using $V_{i,m}$ instead of the ordinal response removes scale-usage bias from the regression analysis. Also, $\{V_{i,m}\}$ has a normal distribution, regardless of the distribution of the ordinal responses. Consequently, the unconditional distributions of $\{\alpha_{i,h}, \beta_{i,h}\}$ are also normal. This last result is not critical to estimating the model. However, it simplifies the interpretation of model parameters. For instance, approximately 68% of the individual-level random factors are within $\pm\lambda_h$.

4.4 Consequences of Brand Personality

The final part of the model is the effect of the brand personality factors on dependent variables:

$$Y = W\Psi + E$$

where Y is a $n \times p$ matrix of dependent variables; W is a $n \times q$ design matrix; Ψ is a $q \times p$ matrix of regression coefficients; and E is a $n \times p$ matrix of normally distributed error terms where the rows are independent, and row vectors have mean 0 and covariance Σ. The design matrix W contains the latent personality factor scores along with other covariates. This study has one dependent variable ($p = 1$): overall Feeling towards the brand and one covariate or control variable: overall Quality of the brand. Both of these variables are survey items measured on the nine-point scale and a cut-point representation is used for them. Again, $\{V_{i,m}\}$ from Equation (2) for Feeling and Quality are used as the dependent and independent variables.

4.5 Prior Distributions

The prior distributions for all means and regression coefficients are normal with mean zero and large variances. All variance parameters are from an inverse gamma distribution. When the brand personality random coefficients have antecedents, then the conjugate, normal-inverse gamma distribution is used for $[\xi_{\alpha,h}, \nu_{\alpha,h}]$ and $[\xi_{\beta,h}, \nu_{\beta,h}]$ in Equations (8) and

(9). In the conjugate distribution, $\nu^2_{\alpha,h}$ and $\nu^2_{\beta,h}$ are truncated inverse gamma (the restriction in Equation (10) implies that $\nu < 1$), and $\xi_{\alpha,h}$ and $\xi_{\beta,h}$ given $\nu^2_{\alpha,h}$ and $\nu^2_{\beta,h}$ are normal with variances proportional to $\nu^2_{\alpha,h}$ and $\nu^2_{\beta,h}$, respectively. This prior simplifies enforcing the constraints in Equations (10) and (11). First, $\nu^2_{\alpha,h}$ and $\nu^2_{\beta,h}$ are generated to be less than one, then $\xi_{\alpha,h}$ and $\xi_{\beta,h}$ are generated to satisfy the constraints given $\nu^2_{\alpha,h}$ and $\nu^2_{\beta,h}$. In the cut-point model, the free parameters are uniformly distributed on $\eta_i(2) < \ldots < \eta_i(K-2)$. The prior distributions for $\theta_{2,c}$ is uniform on 0 to $\pi/2$, and the prior distribution for $\theta_{j,c}$ for $j > 2$ is uniform on 0 to 2π.

5 Illustrative Application

One hundred and nineteen subjects participated in the study described in Section 3. Because of the size of the task, 15 personality items for 30 brands in three categories, subjects evaluated overlapping subsets of brands in their categories. The Markov chain Monte Carlo (MCMC) algorithm imputed the data for brands that a subject did not evaluate (Raghunathan and Grizzle 1995), thus simplifying the analysis. The MCMC algorithm ran for 30,000 iterations. The initial transition period consisted of 20,000 iterations, which were not used in estimation. Of the next 10,000 iterations, every tenth iterate was used in the analysis for a total of 1000. Traces of the iterations indicate that the chain reached the stable distribution well before the 20,000 iteration, and simulation studies using artificial data indicated that 30,000 iterations were more than sufficient: the chains using simulated data frequently converged within 3000 iterations and remained stable at the true parameters thereafter.

The individual–level cut-points in Equation (1) and the grand means and error standard deviations in Equation (2) are nuisance parameters and will not be discussed here. The random effect for scale usage $\{\phi_i\}$ has an appreciable standard deviation, with the posterior mean of τ equal to 0.267 and a posterior standard deviation of 0.0178. This presents considerable evidence for differential usage of the nine–point scale, anchored at minus and plus

Table 4: Posterior Means and Standard Deviations of Brand Personality Angles

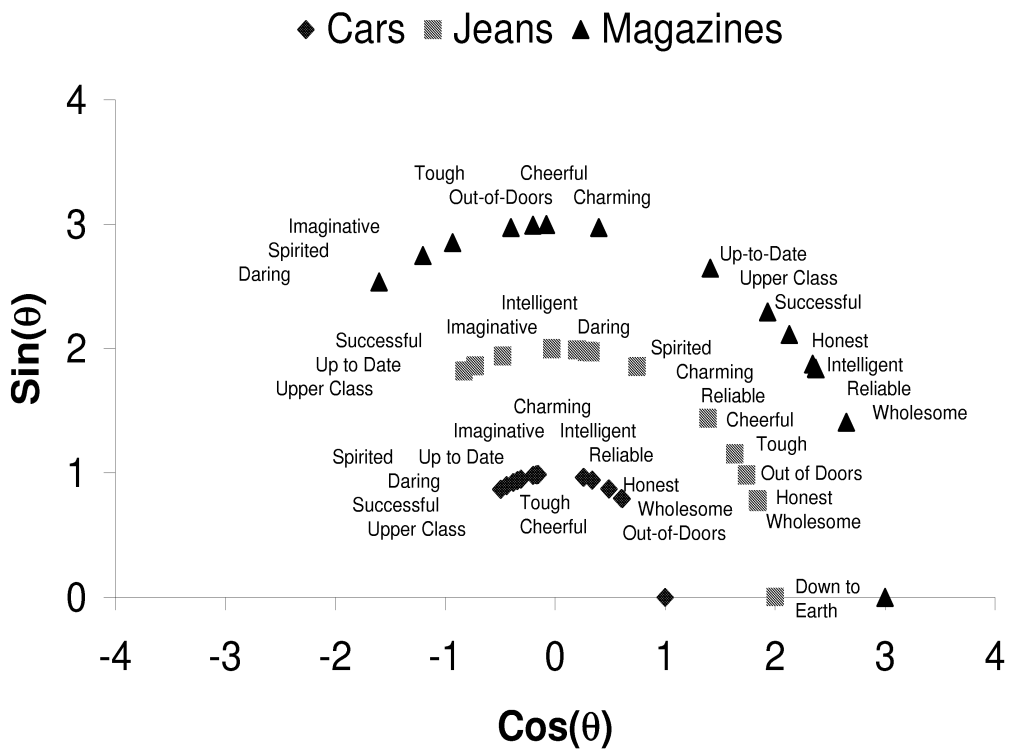
Cars			Jeans			Magazines		
Item	Mean	STD	Item	Mean	STD	Item	Mean	STD
Down-to-Earth	0.000	0.000	Down-to-Earth	0.000	0.000	Down-to-Earth	0.000	0.000
Out-of-Doors	0.916	0.277	Wholesome	0.395	0.206	Wholesome	0.489	0.347
Wholesome	0.922	0.201	Honest	0.404	0.205	Reliable	0.659	0.246
Honest	1.059	0.199	Out-of-Doors	0.515	0.235	Intelligent	0.661	0.233
Tough	1.229	0.246	Tough	0.615	0.246	Honest	0.675	0.235
Cheerful	1.310	0.197	Cheerful	0.803	0.250	Successful	0.782	0.242
Reliable	1.726	0.210	Reliable	1.190	0.251	Upper Class	0.871	0.269
Intelligent	1.735	0.200	Charming	1.407	0.216	Up-to-Date	1.081	0.287
Charming	1.744	0.193	Spirited	1.424	0.248	Charming	1.438	0.300
Imaginative	1.772	0.179	Daring	1.427	0.255	Cheerful	1.597	0.261
Spirited	1.886	0.184	Intelligent	1.472	0.232	Out-of-Doors	1.638	0.417
Up-to-Date	1.921	0.189	Imaginative	1.586	0.231	Tough	1.705	0.379
Daring	1.961	0.201	Successful	1.813	0.219	Imaginative	1.887	0.258
Successful	2.027	0.203	Up-to-Date	1.944	0.217	Spirited	1.983	0.242
Upper Class	2.088	0.217	Upper Class	1.998	0.218	Daring	2.134	0.232

one in the cut-point model, among subjects and testifies to the importance of including this model component. Next, we will present the estimated circumplex model, followed by the regression models for the antecedents and consequences.

5.1 Brand Personality Circumplex

Table 4 displays the posterior means and standard deviations of the category– specific angles $\{\theta_{j,c}\}$ for the brand personality items, sorted in ascending order within category. Down-to-Earth is fixed at the origin, and the angle for Honest was restricted between 0 and $\pi/2$ for identifiability. Because the origin is arbitrary, only differences among angles are informative. The angles for all three categories are arrayed on the arc from 0 to $3\pi/4$. Figure 4 plots the cosines and sines of the angles where the vectors of radius one are items for Cars, of radius two for Jeans, and radius three for Magazines.

Figure 4: Personality Angles



The ordering of the angles for Cars and Jeans are nearly the same, but there are substantial differences for Magazines. For Cars and Jeans, the items with the smallest angles are Down-to-Earth, Out-of-Doors, Wholesome, and Honest, and the items with the largest angles are Upper-Class, Successful, Daring, and Up-to-Date. These two personality domains seem to represent opposite ends of a bipolar scale where more of a trait is not necessarily better. Both Honest and Daring are desirable traits, and the bipolar scale measures a subject's relative perception of these qualities for a brand. The sine of all angles are positive and maximal for angles near $\pi/2$, such as Intelligent, Charming, and Imaginative. Consequently, there appears to be a unipolar scale: the higher the score the better. Under most

circumstances one would prefer to be more intelligent and successful. For the unipolar scale the implicit juxtaposition of personality traits/emotions seems to be absent.

Magazines follow a substantially different pattern with the bipolar and unipolar scales consisting of different items as compared to the other two product categories. Compared to Cars and Jeans, Out-of-Doors and Tough have roughly changed position with Intelligent, Up-to-Date, Upper-Class and Successful. The latter now weigh on the positive end of the bipolar (horizontal) dimension instead of the negative end, but they still load highly on the unipolar (vertical) dimension. The change for Out-of-Doors may be due to the choice of stimuli: none of the magazines explicitly covered out-of-doors topics. Note that the meaning of Reliable may be different for Cars and Magazines. For Cars, it may mean the absence of breakdowns, while for Magazines, it probably implies truthful or accurate, being more close to Down-to-Earth.

Except for Down-to-Earth, the items weigh on both dimensions. For example, Up–to–Date for the three categories is between $\pi/4$ and $3\pi/4$, so it contributes more to the unipolar scale than the bipolar one, which reflects its multiple connotations. For Cars, Up–to–Date partially means using the latest technology, which is an unambiguously desirable characteristic. Up–to–Date also can mean fashionable or stylish, which is in conflict with Down-to-Earth, so individuals may have varying opinions. The same is true of Upper–Class, Successful, and Daring. In one sense, these traits are desirable — few have failure and timid as aspiration goals. But, like Up–to–Date, these adjectives may also connotate "fashionable" as in "daring styling," and may be opposite to Out-of-Doors and Honest.

Current views in psychology on the interpretation of the circumplex are to refrain from labelling the dimensions, $\sin(\theta_{j,c})$ and $\cos(\theta_{j,c})$, and to focus on the interpretation of the relative positions of the items since the traits are distributed around the circle, rather than clustered around the axes as in factor analysis. This reflects the view that the traits are indivisible multidimensional constructs, which favors the "horizontal" (by trait) rather than the traditional "vertical" (by factor) interpretation of the circumplex (McCormick and Goldberg 1997, p.105). However, adding descriptive labels improves the narrative provided that the

reader recognizes the descriptive role for the labels. The bipolar scale seems to juxtaposition "Suave" for negative values and "Sensible" for positive values. The unipolar scale seems to reflect "Capable."

The bipolar Sauve/Sensible scale for Cars and Jeans opposes Aaker's personality domains of "Sophistication" on the left side and "Sincerity" and "Ruggedness" on the right side. The items in this scale thus reflect conflicting values. The separation of the items into Aaker's personality dimensions is visible, but not perfect. The vertical dimension predominately reflects Aaker's "Excitement" and "Competence" domains. For Magazines, the Suave/Sensible scale opposes Aaker's "Sincerity" domain on the right hand side to her "Excitement" domain on the left hand side. The unipolar vertical scale reflects predominantly items related to "Sophistication." Interestingly, for Magazines the items of Sophistication cluster together closely (Upper Class and Charming), which is not the case for Cars and Jeans.

Thus, the circumplex representation reveals several interesting findings. First, there is some support for Aaker's (1997) brand personality domains, since the items tend to cluster together in the domains defined by Aaker. But, the representation of these domains on the circumplex is far from perfect and several domains overlap. The reasons may be that first, the interpretation of the items may be ambiguous, where several personality constructs may underly the meaning of a single item, and second, the actual interpretation of the items may differ according to the product category, yielding a different personality circumplex for different categories.

Figures 5 to 7 plot the brands' locations, which were determined by projecting the item means $\mu_{j,b|c}$ onto the circumplex loadings $[\sin(\theta_{j,c}), \cos(\theta_{j,c})]$, along with the unit vectors for the personality loading. On each iteration of the MCMC, the following equation was fitted by least squares:

$$\mu_{j,b|c} = a_0 + (a_{1,c} + a_{1,b|c}) \sin(\theta_{j,c}) + (a_{2,c} + a_{2,b|c}) \cos(\theta_{j,c}) \tag{12}$$

where brand effects sum to zero, $\sum_b a_{1,b|c} = \sum_b a_{2,b|c} = 0$. The difference of the angles between brands and personality items determines how well the personality item describes the brand (see Figure 3). For example in Figure 5, Porsche and Mercedes will have large,

positive loadings or radii on Upper-Class, while Pontiac and Chevy will have negative ones. The opposite is true for Wholesome.

The closer a brand is to the origin, the more its personality is determined by the category. For example, VW and Volvo for Cars; Gap and Abercombe and Fitch for Jeans; and Money for Magazines are brands that most closely share personality perceptions with their categories. These archetypical brands are positioned, intentionally or not, to epitomize the personalities that customers associate with their categories. This positioning may have positive or negative consequences, depending on the nature of competition in the category. On one hand, because these archetypical brands personify the category, they may offer a blend of attributes that appeal to a wide spectrum of customers, and they may be "top-of-mind" brands. At the extreme, they may define the category, as Xerox and Kleenex once did for copiers and facial tissues. On the other hand, one could argue that these brands have not differentiated themselves from personality perceptions derived from the category and are vulnerable to competition from brands that have more distinctive personality traits that are valued by different customer segments.

Figure 5: Brand Plots for Cars

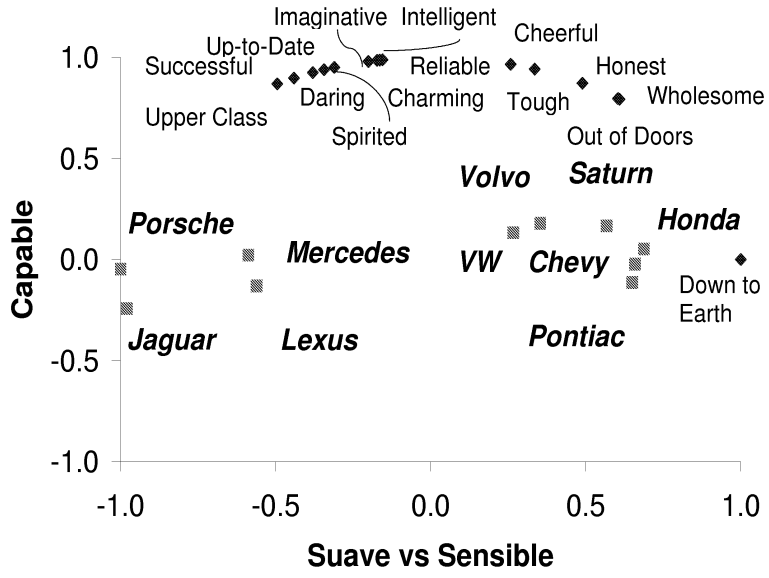
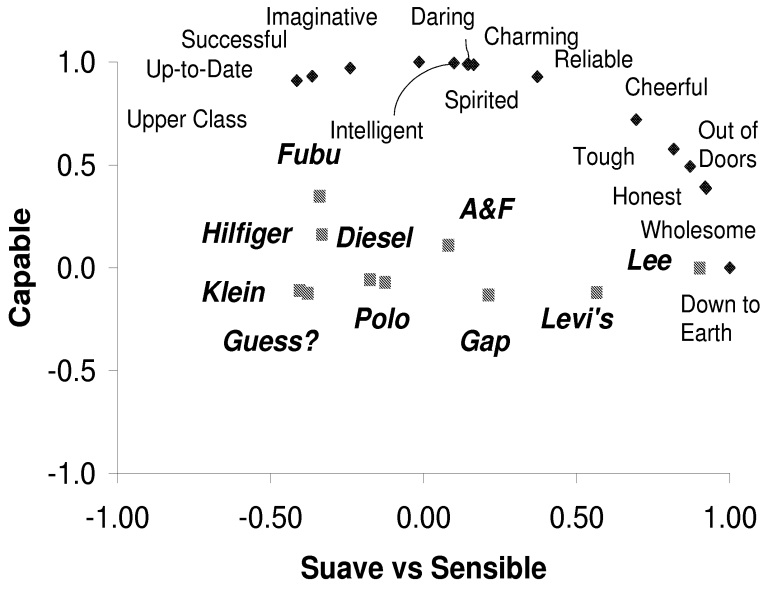


Figure 6: Brand Plots for Jeans

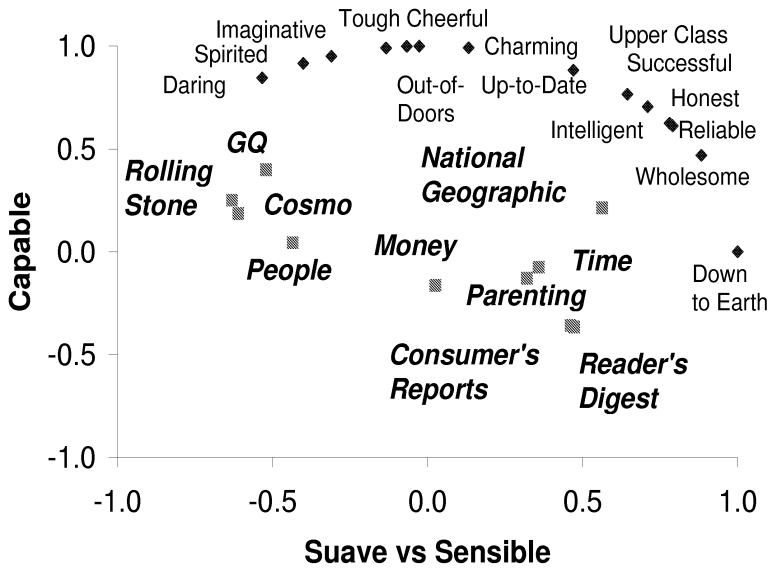


There are distinctive, category dependent patterns for the mean Feeling (preference) ratings for these archetypical brands (See Table 3). The mean Feeling for VW and Volvo (6.1) was somewhat below the average for Cars (6.2). The luxury brands had substantially higher ratings (7.3 to 7.5), while Saturn, Pontiac, and Chevy had substantially lower ratings (4.7 to 5.1); Honda was only slightly lower. These results indicate that VW and Volvo may be vulnerable to competition from the luxury brands if they had a competitively priced offering or from Honda if it slightly repositioned its brand. In contrast to Cars, the archetypical brands for Jeans and Magazines had mean Feeling ratings above their category means. Only Polo (6.24) was higher than Gap (6.16), while Abercombe and Fitch (5.3) was closer to the category mean (5.2). Money[4] (6.1) was the second highest rated magazine after Time (6.6), while the category mean was (5.8). These results seem to indicate that Money and Gap have benefited from being archetypical brands.

In Figure 5 there seem to be three clusters of car brands. At the extreme left, the prestige brands of Porsche, Mercedes, Jaguar, and Lexus load heavily on Suave, while mass-

[4]Subjects were undergraduate business majors.

Figure 7: Brand Plots for Magazines

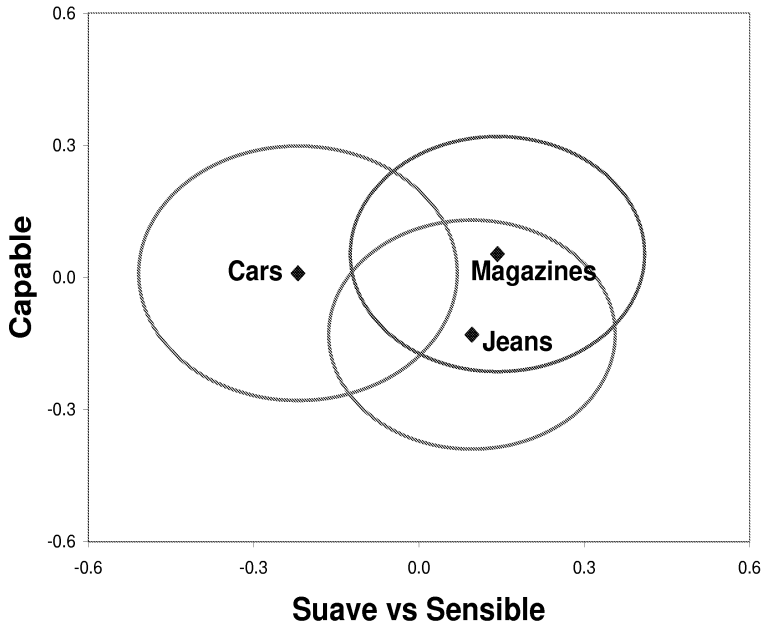


market brands of Saturn, Honda, Chevy, and Pontiac load heavily on Sensible. As previously mentioned, VW and Volvo are near the center, and typify the category. The orthogonal projections of the luxury brands on Upper-Class, Successful, and Up-to-Date has large, positive radii, while the projections of the mass market brands have large, negative radii. Opposite results hold for Down-to-Earth, Out-of-Doors, Wholesome, and Honest. Items in the Capable domain — Intelligent, Reliable, Charming, and Imaginative – are in the second quadrant. Consequently, the luxury brands have positive projections on this dimension, and the mass-market brands have negative projections.

Figure 6 displays the brands and personality items for Jeans. Lee and Levi load more heavily on Sensible, while Fubu, Tommy Hilfiger, Calvin Klein, Guess?, Diesel, and Polo load more heavily on Suave. Fubu enjoys the highest rating on the both the Capable and Suave dimensions. Although older readers may wonder, "What is Fubu?", it is a premium brand for the rap-music subculture.

Magazines have an intriguing configuration that provides some insight into the change

Figure 8: 68% Probability Circles for Within–Category Personality Heterogeneity



in the relative positions of the personality items. Rolling Stone, Cosmopolitan, Gentleman's Quarterly, and People load on Suave, while National Geographic, Time, Parenting, Consumer's Report, and Reader's Digest load on Sensible. Previously we mentioned that Out-of-Doors and Tough have roughly changed position with Intelligent, Upper-Class, Up-to-Date, and Successful. Consequently, National Geographic and Time rate highest on Intelligent, while Rolling Stone, Cosmopolitan, and People rate the lowest. Conversely, Gentleman's Quarterly, Rolling Stone, and Cosmopolitan are rated highest on Tough while Consumer's Reports and Reader's Digest are rated lowest. Again, it is apparent that the connotation of personality items are category specific. For Cars and Jeans, Tough may be interpreted as strong or sturdy, while for Magazines it may mean hard-hitting or controversial.

Figure 8 graphs the three categories, which are represented by circles that describe the heterogeneity of the within-category effects. The locus $(a_{2,c}, a_{1,c})$ of a circle is the mean evaluation projected onto the item vectors (see Equation 12). The radius of the circle for category c is λ_c, the standard deviation of the within-category random coefficients for $\alpha_{i,c}$

Table 5: Category–Level Regression Model

Alpha is the weight on the unipolar scale Capable, and beta is the weight on the bipolar scale Suave/Sensible. Lambda is the unconditional standard deviation of alpha and beta.

		Alpha		Beta		Error STD		R-Square	
Category	Lambda	Interest	Image	Interest	Image	Alpha	Beta	Alpha	Beta
	Posterior Mean								
Cars	0.289	0.182	-0.246	0.411	-1.255‡	0.673	0.765	0.351	0.338
Jeans	0.260	-0.886	-0.253	0.649	-1.362‡	0.671	0.644	0.436	0.497
Magazines	0.267	-0.867‡	-0.908‡	1.025‡	-0.759‡	0.558	0.762	0.617	0.314
	Posterior STD								
Cars	0.021	1.065	0.459	0.281	0.396	0.101	0.349	0.146	0.144
Jeans	0.017	0.550	0.478	0.459	0.507	0.119	0.223	0.181	0.147
Magazines	0.016	0.204	0.186	0.272	0.224	0.084	0.512	0.120	0.150

‡ Posterior mean of the regression coefficient is two or more posterior standard deviations from zero.

and $\beta_{i,c}$. (See Equation (3) and Table 5.) The interpretation is that approximately 68% of the subjects' appraisals of category personality are within the circle. Cars load more heavily on Suave, and Magazines and Jeans load more heavily on Sensible. Magazines and Cars are viewed to be more Capable than Jeans. Although the category means are substantially different, there is considerable heterogeneity, as reflected in the size of the overlapping circles.

5.2 Antecedents for Brand Personality

The circumplex model of Equation (3) decomposes the factor scores into between–category, within–category, and brand random effects. The between–category personality effects $\{\alpha_i, \beta_i\}$, which do not have regression relations in this application, have a common standard deviation, λ, that measures the dispersion of personality perceptions across subjects. The posterior mean of λ is 0.265, and the posterior standard deviation is 0.017. In the cut-point model the cut–points range from minus to plus one, so a random effects standard

deviation of 0.265 represents considerable variation in the common personality perceptions across categories.

Table 5 reports the estimated parameters for the regression of category–level personality factors, $(\alpha_{i,c}, \beta_{i,c})$, on Interest and Image, along with fit statistics. The posterior mean of the unconditional standard deviation λ_c ranges from 0.260 to 0.289 and the posterior standard deviations vary from 0.016 to 0.021. These estimates indicate substantial heterogeneity in subjects' evaluation of category–level personality factors, as shown in Figure 8. Given these estimates of λ_c, one should conclude that brand personality has to be considered in the context of the category personality. In particular, because of the magnitude of λ_c, the covariance between brands in the same category (Equation 6) is substantially larger than the covariance between brands in different categories (Equation 7).

The next four columns of the Table 5 displays the estimated regression coefficients. For all three categories if a subject believes that brand selection is informative about one's personality (Image), then they tend to respond more to the negative end of the bipolar scale or the Suave dimension (beta). For Magazines high Interest in the category is also related to a tendency to respond to Suave instead of Sensible, and higher scores for Interest and Image tend to lead to lower evaluations of Capable scale (alpha). It seems that subjects who are highly involved with Magazines tend to be more discerning.

The rest of the Table 5 presents fit statistics. The maximal error standard deviation is one when $\alpha_{i,c}$ and $\beta_{i,c}$ do not have a regression relation. The Bayesian R-Square is the correlation squared between the dependent variable and its predicted value from the regression model. Among the six regressions, the strongest relation is for Magazines' Capable (alpha). Thus, our analysis reveals that the antecedents affect within–category personality perceptions.

Table 6 reports the posterior means of the regression model for brand-level random effects, $\{\alpha_{i,b|c}, \beta_{i,b|c}\}$. Posterior standard deviations are not reported in the interest of space. The first column reports the posterior standard deviation of the unconditional standard deviation, $\lambda_{b|c}$, of the random coefficients. The dispersion in brand personality evaluations across subjects is substantially higher at the brand level than either the between-category or within-

Table 6: Brand–Level Regression Models' Posterior Means

Alpha is the weight on the unipolar scale Capable, and beta is the weight on the bipolar scale Suave/Sensible. Lambda is the unconditional standard deviation of alpha and beta.

		Alpha		Beta		Error STD		R-Square	
	Lambda	FAMIL.	RELAT.	FAMIL.	RELAT.	Alpha	Beta	Alpha	Beta
PRSCH.	0.409	0.302	0.448	-0.889	0.376	0.875	0.686	0.260	0.357
JAG.	0.610	0.276	0.395	0.426	-0.202	0.885	0.718	0.241	0.375
MRCDS.	0.415	0.363	0.392	-0.635	0.258	0.888	0.686	0.290	0.321
LEXUS	0.479	0.442	0.507	-0.044	0.058	0.857	0.706	0.295	0.386
VOLVO	0.389	0.715‡	0.741‡	0.964‡	-0.700‡	0.542	0.767	0.707	0.357
VW	0.356	0.763‡	0.776‡	-1.281‡	0.970‡	0.614	0.636	0.602	0.572
SATRN.	0.470	0.387	0.839‡	-1.239‡	0.754‡	0.703	0.672	0.532	0.504
HONDA	0.400	0.479‡	0.835‡	1.211‡	-0.685‡	0.610	0.741	0.624	0.408
CHEVY	0.454	0.333	0.722‡	1.236‡	-0.801‡	0.663	0.684	0.573	0.501
PONTC.	0.478	0.447‡	0.535‡	-1.266‡	1.125‡	0.694	0.631	0.586	0.560
FUBU	0.841	0.158	0.294	0.105	-0.043	0.929	0.671	0.220	0.350
T.HLFG.	0.428	0.450	0.764‡	-1.265‡	0.785‡	0.668	0.721	0.575	0.445
C.KLN.	0.338	0.494‡	1.063‡	0.639	-0.369	0.513	0.722	0.733	0.426
GUESS?	0.376	0.799‡	0.850‡	-1.194‡	1.014‡	0.505	0.662	0.754	0.539
DIESEL	0.490	0.548‡	0.358‡	-0.786‡	0.821‡	0.502	0.688	0.765	0.509
POLO	0.336	0.604‡	1.071‡	-1.510‡	0.852‡	0.540	0.691	0.710	0.477
A&F	0.522	0.456‡	0.667‡	0.598	-0.361	0.603	0.883	0.630	0.174
GAP	0.343	0.618‡	0.868‡	1.113‡	-0.833‡	0.528	0.747	0.711	0.415
LEVI'S	0.345	0.534‡	0.971‡	1.230‡	-0.520‡	0.555	0.700	0.667	0.496
LEE	0.631	0.148	0.544‡	-0.150	0.149	0.886	0.790	0.237	0.238
GQ	0.393	0.914‡	0.548‡	-1.084‡	0.983‡	0.503	0.696	0.759	0.479
ROL.STN.	0.395	0.798‡	0.633‡	-1.034‡	0.913‡	0.551	0.688	0.696	0.482
COSMO.	0.406	0.330	0.720‡	-1.163‡	0.986‡	0.547	0.641	0.712	0.566
PEOPLE	0.384	0.857‡	0.866‡	-0.606	0.497	0.608	0.798	0.601	0.316
MONEY	0.351	0.173	1.135‡	1.148‡	-0.661‡	0.507	0.752	0.744	0.415
TIME	0.355	0.451	0.897‡	-1.191‡	0.735‡	0.654	0.758	0.532	0.384
NAT.GEO.	0.387	0.536‡	0.890‡	-1.161‡	0.842‡	0.584	0.744	0.644	0.416
PRNT.	0.438	0.339	0.484‡	-0.078	0.198	0.848	0.629	0.249	0.503
CNS.RPT.	0.407	0.584‡	0.988‡	-0.023	0.037	0.543	0.878	0.685	0.183
RD.DGST.	0.340	0.422	1.054‡	-1.216‡	0.614‡	0.634	0.694	0.526	0.494

‡ Posterior mean of the regression coefficient is two or more posterior standards from zero.

category level. Among Cars, VW and Volvo, which are archetypical brands, have the lowest heterogeneity in personality evaluations and Jaguar the highest. Among Jeans, subjects are most homogeneous about their appraisals of Calvin Klein, Gap, and Levi's and most heterogeneous about Fubu. Magazines have a smaller range of brand heterogeneity with Reader's Digest, Money, and Time being the lowest, and Parenting, Consumer Reports, and Cosmopolitan being the highest). It may be coincidental that subjects' brand perceptions tend to be more homogeneous for the archetypical brands, except Abercombe & Fitch, while very distinctive niche brands, particularly Jaguar and Fubu are most heterogeneous. The large dispersion for Fubu probably reflects its positioning as a niche brand for the Rap–music subculture, which generates strong positive or negative affects.

The estimated values of $\lambda_{b|c}$ are more than just derived quantities from the circumplex model; they also are informative about brands' positioning. Generalizing from this single study, it appears that mass market brands with unambiguous positioning have relatively less heterogeneity in personality perceptions than niche brands, especially those positioned to generate high affect.

The brand-personality antecedents are Familiarity with the brand and the subject's Relation to it. In general, the higher the score for Familiar and Relation, the more positively he or she views the brand on the Capable (alpha) scale. The results are not unidirectional for the Suave/Sensible (beta) scale, which might have been expected for this bipolar scale. There are distinct effects with brand personality traits loading highly on that dimension. For example, the higher the Familiarity with VW, the more it weighs on the Suave domain, while the higher the Relation, the more it weighs on the Sensible domain. Volvo has the opposite relationship. Although both these brands tend to inherit the category personality when averaged across subjects,[5] subjects with different Familiarity and Relation to the brand tend to view their brand personalities differently.

The result for VW may reflect the recent change in its positioning. Its traditional positioning is reflected in its name, "People's Car," and was the canonical brand for efficient,

[5]VW and Volvo are near the origin in Figure 5.

utilitarian, no thrills nor frills transportation. Over the last decade, VW has repositioned the brand to emphasize sophistication and autobahn cool. It may be the case that subjects who are familiar with the brand's positioning in its advertisements view it higher on the Suave scale, while subjects who have first-hand experience, thus a greater Relation, value its Sensible characteristics that inform the actual driving experience. The pattern of the coefficients is reversed for Volvo, which still emphasizes its traditional Sensible dimension – safety and reliability — in advertisements while loading their product with Suave characteristics: premium interiors, advanced technology, and sporty handling. Similar reasoning extends to the rest of the brands of Cars. Similar to VW, Saturn and Pontiac tend to emphasize the sophistication dimension in their ads, but their product tends to be more Sensible. Similar to Volvo, Honda and Chevy tend to emphasize the Sensible dimension in their ads, but their products are at least as sophisticated as VW, Saturn, and Pontiac.

The pattern of coefficients is more homogeneous for Jeans and Magazines than for Cars. Where there is a significant relation, subjects who are Familiar with the premium brand of jeans rate them higher on Suave, while subjects who perceive a stronger Relation rate them as Sensible. The opposite holds for Gap and Levi's. Except for Money Magazine, high Familiarity leads to Suave, while high Relation leads to Sensible. Money Magazine is positioned to provide sensible advice on personal finances, yet its articles and advertisements are clearly designed for a successful, upper-class audience. Consequently, subjects who are only familiar with Money but do not frequently read it may rate it as being more Sensible, while more engaged subjects tend to rate it as more sophisticated or Suave.

In general, we conjecture that the nonuniform, bidirectional results across brands in the effects of Familiarity and Relation on Suave/Sensible (beta) may be partially driven by differences in the subject's awareness of the brand and his or her actual experience with the brand. One function of branding is to create awareness of the product in potential customers, which may be reflected in Familiarity. Among customers or users, the brand's personality created in advertisements is modified by the consumption experience, which may be captured by the Relation construct. If a brand overemphasizes Suave or Sensible in their

advertising, while the consumption experience does not fully match the advertising, the signs of Familiarity and Relation will be significant. Brands that have better alignment between advertising and product characteristics may have insignificant coefficients for Familiarity and Relation. In this study these brands are the luxury car brands; Fubu, Calvin Klein, Abercombe & Fitch, and Lee jeans; and People, Parenting, and Reader's Digest magazines. Although the personality of these brands are insensitive to subjects' Familiarity and Relation, they have very different Feeling evaluations: the luxury cars, Calvin Klein, and People have high, mean ratings; Fubu, Lee, and Parenting have low, mean ratings; and Abercombe & Fitch and Reader's Digest are moderate. Because this study was not designed to test the congruence between advertising and products for brand personality, we only note that our results seem consistent with these conjectures.

5.3 Consequences of Brand Personality

Table 7 reports the regression model for regressing Feeling towards the brand onto brand Quality and the personality factors. Not surprisingly, there is a positive relation between Feeling and Quality. Feeling is positively related to the subject, category, and brand evaluations of Capable (alpha). Subjects whose between-category personality leans more to Suave than Sensible (beta) tend to have a higher Feeling towards the brands, with an estimated coefficient of –0.653. This result may indicate halo effects in that subjects who evaluate all brands more highly on the Suave dimension also tend to have higher evaluations of Feeling towards all brands. However, we included Quality as a covariate to control for such halo effects. Feeling is not related to within–category and brand evaluations of Suave/Sensible. This result confirms the fact that the Suave/Sensible dimension measures the relative personality perception of two opposing domains. A priori, scoring highly on one end of the scale or the other does not necessarily imply a higher rating on Feeling for the brand. The Bayesian R-square is 0.725, and the partial R-square for the personality factors after adjusting for Quality is 0.212, which indicates that Quality is a more important determinant of Feeling than the personality factors, but brand personality cannot be ignored. In summary,

Table 7: Posterior Analysis of Regression Model for Feeling towards Brand

Alpha is the weight on the unipolar scale Capable, and Beta is the weight on the bipolar scale Suave/Sensible.

	Mean	STD	Ratio
Mean or Intercept	0.238	0.032	7.426
Between–Category Alpha	0.440	0.095	4.621
Within–Category Alpha	0.289	0.133	2.176
Brand Alpha	1.061	0.038	28.223
Between–Category Beta	-0.653	0.087	-7.526
Within–Category Beta	-0.018	0.082	-0.219
Brand Beta	0.071	0.068	1.039
Quality	0.340	0.018	18.905
Error STD	0.350	0.011	
R-Square	0.725	0.016	

brand personality, in particular Capable, is systematically related to overall evaluations of brand personality and testifies to the external validity of the brand personality construct.

6 Discussion

Where functional brand benefits are nowadays being matched quickly by competitors, it is becoming more and more evident that brand marketers need to differentiate their brands, and add perceived consumer value, on the basis of brand personality imagery (Aaker 1997). Therefore, brand–strategy planners need to be able to study the perceived personality characteristics of their brand and those of competitive brands, to find ways to shape their brand's imagery-building communications to better tap into the needs of their customers. However, brand personality characteristics are inevitably heavily influenced by the nature of the product category itself (Durgee and Stuart 1997; Domzal and Kernan 1992). Thus, one needs to separate category-level and brand-level determinants of a brand's perceived personality characteristics, which is especially important in situations where brand strategists look to brands

in other product categories for strategic inspiration. Category-level personality characteristics become particularly salient for brand extensions to new categories and cross–branding between brands in different categories.

The methodology developed and illustrated in this paper should prove helpful in meeting this need, and our results quite clearly show the value of partialling-out category personality in meaningful analysis of brand personalities. They make clear that the meaning of brand personality descriptors can be significantly influenced by the category context. The personality descriptor "intelligent," for instance, appears very close in meaning to "reliable" for cars, but to "imaginative" and "daring" for jeans, and to "honest" for magazines. (See Table 4). We therefore believe that the category specific personality representation that we provide enables deeper insights and improved brand management strategy than have been possible heretofore. An additional benefit of the proposed methodology is that it accounts for the rank order nature of the personality scales and idiosyncratic scale usage (Rossi, Gilula and Allenby 2001). This disentangles respondents behavior with respect to the measurement scales and their underlying brand personality perceptions.

The three categories — Cars, Magazines, and Jeans — used in our study had clearly distinct baseline category personality characteristics, as is evident in Figures 4 and 8. While such category differences had previously been qualitatively discussed by researchers such as Levy (1959), our method enables a level of empirical quantification and precision heretofore missing from the literature. Such analysis ought to be particularly useful in cases where brands originating in one category are stretched or leveraged into other categories, via brand extensions. In such cases, brand planners need to assess which other product categories fit an existing brand, so being able to gauge this similarity among categories, in a personality structure sense, is critical for implementing those brand extensions. The same results allow us to identify the archetypical brands of specific categories (e.g. in Figure 5 VW and Volvo are closest to the origin), which is important in improved positioning for these and other brands, involving potential modification of their brand personality though advertising, amongst others.

Existing inventories of brand personality descriptors and dimensions (such as those developed by Aaker 1997) are often used uniformly across very different products and categories. Since it is likely that not all these descriptors are equally salient or relevant for every category, this complete listing forces survey respondents to provide some perception ratings that may appear inapplicable to the category being rated. However, this undesirable state of affairs is caused by the current paucity of ways for the researcher to systematically decide which perceptions are relevant and should be attended to in a particular category, and which ones could be ignored. As Table 5 demonstrates, our approach gives us a way to assess which particular brand personality traits drive preference in each category. For example, subjects who believe that brand selection is informative about one's personality respond most to traits such as Upper-Class, Up-to-Date and Successful (Aaker's "Sophistication") for Jeans and Cars. Thus, our approach allows one to further tailor brand personality questionnaires to the category in question, in future research.

Our results of brand personality differences, once the category personality has been partialled–out (Figures 5, 6, and 7), show an intuitively appealing characterization of the differences of personalities of brands within the categories. The fact that these personality perceptions significantly shape overall evaluative feelings towards the brand is evidenced in the results of Table 7, which shows that the coefficients of the unipolar Capable personality dimension, in particular, are highly significant. Our model also enables us to study the impact of category and brand familiarity and relevance on the ratings and structure provided by a subject (Tables 5, 6, and 7). Thus, our approach allows us to identify both the antecedents and consequences of brand personality. Thus, next to providing diagnostic value for brands in terms of their personality traits, the approach allows us to study how brand personality is affected by and can be modified through explanatory variables. And, it enables us to study the extent to which brand personality affects outcome measures of predictive and managerial relevance. This enhances the predictive validity of the brand personality construct.

Importantly, in the regression results of Table 7, while the coefficients for the unipolar personality dimension, Capable, are highly significant, that for the bipolar dimension,

Suave/Sensible, are not. This demonstrates the value of the use of the circumplex model for brand personality characteristics, instead of the unconstrained factor models that have been popular in the past (e.g., Aaker 1997). Our circumplex formulation was justified on the basis that it has been frequently used as a suitable model for the representation of human personality descriptors (e.g., Gurtman 1997). However, that literature has not yielded an implementable mathematical representation of the circumplex, that allows one to deal with features such as the rank-order nature of the data; scale-usage effects; missing data; subject, brand and category specific components; and antecedents and consequences of personality, unlike the proposed formulation.

Our illustrative circumplex application yielded the key insight that brand personality characteristics appear to be of two fundamentally different types: unipolar and bipolar scales. The unipolar scale, here labelled "Capable," is comprised of items, such as Intelligent, Reliable, Charming, and Imaginative where more-is-better. The bipolar scale, here labelled "Suave versus Sensible," appears to express an inevitable trade-off between domains consisting of items such as Wholesome, Down-to-Earth and Honest at one end and Upper-Class, Up-to-Date and Successful at the other for cars and jeans. We believe this is a fundamental insight into the nature of cultural stereotypes about brand personality: a brand cannot usually be very Sophisticated and Daring, without compromising its perception of being Honest, Wholesome and Down-to-Earth. While this may be obvious in hind-sight, and our finding is still tentative, being based on a single application across three categories, the fact that our structure forces a choice on this trade-off, while the non-circumplex models do not, we think is important. No such trade-off is apparently needed for the items on the unipolar dimension. This differing nature of the two dimensions helps us understand why, in the Table 7 regression results, the coefficient for the unipolar brand personality dimension is strongly significant, that for the second bipolar dimension is not. While the unipolar dimension is unambiguously a more-is-better dimension, with higher values on it leading clearly to higher evaluations of brand feelings, scores on the bipolar dimension were not significantly related to feelings. A conjecture for future research is that there exists an interaction be-

tween the subject's and brand's personality: subjects who view themselves as more Sensible than Suave may have higher preferences for Sensible brands.

Taken together, the ability to separate category personality structures from brand personality ratings, and the use of a circumplex formulation, are the major contributions of the model developed and illustrated in the present research, with important strategic research applications. But, several limitations remain, suggesting avenues for future research. First, the decomposition of brand personality into unipolar and bipolar scales may be a function of the personality items used in the study. These items were selected from Aaker (1997), who culled them from an enormous set of possible items. Aaker's criterion for inclusion may differ from that one would use for a circumplex model. A reexamination of items based on the circumplex model could possibly lead to bipolar scales that force tradeoffs between opposing value domains. Second, we did not collect the subject's personality self-evaluation, so we were unable to confirm Aaker's (1999) result that self–schematic traits lead to stronger brand preferences. Such a study would be informative about brand personality segmentation and, as previously mentioned, may indicate subject and brand interactions. Third, the data used in our illustrative application came from three product categories, which limits the generalizability of the personality structures we obtained. Future research should extend the data collection to more categories, with more and different brands, for enhanced generalizability. Whereas such an extension would yield a close to insurmountable burden to respondents, the use of a split questionnaire design in combination with the feature of our approach that enables one to impute of the resulting missing data would greatly help to reduce that burden. Fourth, there might exist the need and potential to apply our model to include cultures or sub-cultures in the extraction of category personality. Some prior research (e.g. Aaker, Martinez, and Gariolera 2001) has shown that consumers in different cultures (in their study, Japan, Spain and the U.S.) evaluate brands on somewhat different personality dimensions. Since our model can be used to separate out cultural and category structures from brand personality ratings and enables one to remove the effect of culture-specific response scale usage (Ter Hofstede, Steenkamp and Wedel 1999), it may prove to be of great value in an

era where more and more brands are being marketed on a global basis (cf., Steenkamp, Batra and Alden, 2003).

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