A Study on the Synthetic Fuzzy Evaluation Method of Brand Equity

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Abstract Brand equity has been one of the critical areas for marketing management since it emerged. Brand equity is widely acknowledged as an index system of measuring the effectiveness of branding strategies. However, little systematic research has been done to develop model to evaluate brand equity. This study adopts the theory of fuzzy mathematics and analytic hierarchy process (AHP) to propose a fuzzy evaluation model of brand equity from a customer perspective, and also gives a numerical illustrative example to test and verify this model. The proposed model can evaluate both individual factor and integrated brand equity, which can illustrate brand market status and provide a real guide for organizations to manage marketing resource to enhance brand equity.

Key words Brand equity, Synthetic fuzzy evaluation, AHP

1 Introduction The concept of brand equity was addressed by advertising agents several decades ago and has recently emerged as an important research area in marketing. Several conceptualizations of brand equity exist, and these conceptualizations have offered valuable insight into the processes that consumers evaluate and choose brands among a given product category. However, an instrument to evaluate brand equity from a customer perspective has been lacking [1]. In marketing literature, there have been two general perspectives for studying brand equity: financial and consumer based. Financial perspective is to estimate the asset value of a brand in the marketplace. For example, Interbrand Group uses a subjective multiplier of brand profits based on the brand’s performance along seven dimensions as leadership, stability, market stability, internationality, trend, support, and protection. The purpose of the financial based research is for accounting activities, such as acquisitions and mergers. Consumer perspective is based on the customer’s perceptions and behavior with respect to the brand. The perspective focuses on why a brand behaves better than other brands do in the marketplace. Keller pointed out that the source of brand equity is customer knowledge [2]. Aaker suggested that evaluation of brand equity should well elicit its source and provides real guidance for creation of brand equity [3]. It is very important for marketers to know how to form and manage brand equity.

Therefore, the purpose of the study is to evaluate brand equity from customer perspective. Based on fuzzy mathematics and brand equity theory, an index system of brand equity evaluation is given and a synthetic fuzzy evaluation method is discussed by applying fuzzy multi-character decision method. This article is organized into four parts. The next section describes the indexes of evaluating brand equity. Then the fuzzy method for evaluating brand equity is given, and an example is given to illustrate the use of the proposed method. Concluding remarks are included finally.

2 Index System of Brand Equity

2.1 Brand Awareness Brand awareness refers to the ability of a potential buyer to recognize or recall that a brand is a member of a certain product category [4]. According to Keller, brand awareness consists of two sub-dimensions: brand recall and brand recognition [2]. Brand recognition relates to consumers’ ability to confirm prior exposure to the brand when given the brand as a cue. Brand recognition requires that consumers correctly discriminate the brand as having been seen or heard previously. Brand recall relates to consumers’ ability to retrieve the brand when given cues such as the product category, the needs fulfilled by the category, or some other type of probe. Brand recall requires that consumers correctly generate the brand from memory.

2.2 Brand Association Brand association is anything linked in memory to a brand [4]. It could be product-related or non-product-related attribute. Brand image can often viewed as a set of associations of a brand.
Krishnan described association characteristic as set size, valence, and uniqueness. Set size refers to the number of associations evoked by a brand name. The magnitude of brand association ties to exposure frequency of a brand and consumer personal usage experience. Valence is about net positive associations. Consumers have many associations of a brand, some positive and others negative. These associations will shape consumers’ attitude to a brand together. Therefore, it is important to assess the relative presence of positive versus negative associations. Uniqueness is the associations differentiate a brand from other brands. It reflects product positioning in consumer mind.

2.3 Perceived Quality
Perceived quality can be defined as the consumer’s judgment about a product’s overall excellence or superiority. Many researchers have demonstrated that perceived quality played an important role in brand decision. Aaker stated that perceived quality is often consumers’ purchase core. Perceived quality consists of product attributes like design, capability, function and service.

2.4 Brand Loyalty
Oliver defined brand loyalty as a deeply held commitment to rebuy or repatronize a preferred product/service consistently in the future, thereby causing repetitive same-brand or same brand-set purchasing, despite situational influences and marketing efforts having the potential to cause switching behavior. In according with the definition, we know that brand loyalty includes two aspects: attitude and behavior. Attitude aspect refers to purchase intention; Behavior aspect includes purchase frequency, word of mouse and price sensitive. Tab. 1 shows the index system of brand equity evaluation.

<table>
<thead>
<tr>
<th>Brand equity (X)</th>
<th>Brand awareness (X₁)</th>
<th>Brand association (X₂)</th>
<th>Perceiver quality (X₃)</th>
<th>Brand loyalty (X₄)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand recall (X₁₁)</td>
<td>Number (X₂₁)</td>
<td>Product design (X₃₁)</td>
<td>Purchase intention (X₄₁)</td>
<td></td>
</tr>
<tr>
<td>Brand recognition (X₁₂)</td>
<td>Valence (X₂₂)</td>
<td>Product capability (X₃₂)</td>
<td>Purchase frequency (X₄₂)</td>
<td></td>
</tr>
<tr>
<td>Uniqueness (X₂₃)</td>
<td>Product function (X₃₃)</td>
<td>Service system (X₄₃)</td>
<td>Word of mouse (X₄₃)</td>
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<td></td>
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<td></td>
<td>Price sensitive (X₄₄)</td>
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</tbody>
</table>

3 Synthetic Fuzzy Evaluation of Brand Equity
3.1 The Establishment of Synthetic Fuzzy Evaluation Model
According to the basic theory of synthetic fuzzy evaluation, this paper put forward with a model for evaluating brand equity. The model can be described as following:

3.1.1 Establishing the factor set and remark set
Suppose \( X = (X_1, X_2, \ldots, X_n) \) is the first factor set, where \( n \) is the factor number of first evaluation index level, \( X_k = (X_{k1}, X_{k2}, \ldots, X_{ki}) \) is the second factor set, where \( i \) is the factor number of second evaluation index level which related to the \( k \) factor in first level. \( V = (V_1, V_2, \ldots, V_m) \) is the remark set given by customer to some factor, where \( m \) is the number of remark grade. Here, we use five remark grades as \((100, 80, 60, 40, 20)\) .

3.1.2 Establishing the weight set
Not all the factors have equal influence on brand equity. According to importance, weight is assigned to each factor. We calculate weight of each factor by using Satty’s AHP (analytic hierarchy process) method. \( W = (w_1, w_2, \ldots, w_n) \) is the weight set of first level factor, where \( W_k \) is weight of the \( k \) factor and \( 0 < w_k \leq 1 \), \( W_k = (w_{k1}, w_{k2}, \ldots, w_{ki}), k = 1, 2, \ldots, n \) is the weight set of second level factor.

3.1.3 Computing fuzz evaluation matrix
According to subordinate degree, we establish fuzz evaluation matrix \( R_k \) for factor \( X_k \).
After calculating people ratio, we get fuzz evaluation matrix. Then we compute synthetic fuzzy evaluation vector as following:

\[ (\begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} )_{m \times n} \]

\( r_{ij} = \frac{d_{ij}}{d} \), which means the ratio of people who give each remark grade to each factor. Using \( R_k \) and \( W_k \), we can get synthetic fuzzy evaluation vector \( B_k = W_k \cdot R_k = (b_{k1}, b_{k2}, \ldots, b_{km}) \). According to remark grade, we can compute each factor’s grade \( Z_k = B_k \cdot V^T \) and the total grade of brand equity \( Z = W \cdot Z_k = \sum_{k=1}^{n} w_k Z_k \).

### 3.2 Example analysis

Brand A has been chosen for the empirical analysis. A total of 16 people form the evaluation group for this test. In term of AHP method, we get weight vector of each person. Then we calculate the average of these weights and establish final synthetic weight shown in Tab. 2.

| Table 2. The Mean of the Normalized Weights for Each Factor |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Factor          | \( X_1 \)       | \( X_2 \)       | \( X_3 \)       | \( X_4 \)       | \( X_{11} \)     | \( X_{12} \)     | \( X_{21} \)     | \( X_{22} \)     |
| Weight          | 0.201           | 0.211           | 0.276           | 0.312           | 0.416           | 0.584           | 0.287           | 0.388           |
| Factor          | \( X_{13} \)    | \( X_{14} \)    | \( X_{23} \)    | \( X_{24} \)    | \( X_{31} \)    | \( X_{32} \)    | \( X_{33} \)    | \( X_{34} \)    |
| Weight          | 0.216           | 0.206           | 0.250           | 0.228           | 0.239           | 0.336           | 0.261           | 0.164           |

After calculating people ratio, we get fuzz evaluation matrix. Then we compute synthetic fuzzy evaluation vector as following:

\[ B_1 = W_1 \cdot R_1 = (0.2718, 0.4375, 0.1615, 0.125, 0) \]
\[ B_2 = W_2 \cdot R_2 = (0.1914, 0.347, 0.2094, 0.1453, 0.1008) \]
\[ B_3 = W_3 \cdot R_3 = (0.2925, 0.2792, 0.3358, 0.0569, 0.027) \]
\[ B_4 = W_4 \cdot R_4 = (0.3118, 0.2513, 0.2763, 0.1236, 0.0252) \]

Therefore, the grade of each factor will be:

\[ Z_1 = 0.2718 \cdot 100 + 0.4375 \cdot 80 + 0.1615 \cdot 60 + 0.125 \cdot 40 + 0 \cdot 20 = 76.87 \]
\[ Z_2 = 0.1914 \cdot 100 + 0.347 \cdot 80 + 0.2094 \cdot 60 + 0.1453 \cdot 40 + 0.1008 \cdot 20 = 67.29 \]
\[ Z_3 = 0.2925 \cdot 100 + 0.2792 \cdot 80 + 0.3358 \cdot 60 + 0.0569 \cdot 40 + 0.027 \cdot 20 = 74.55 \]
\[ Z_4 = 0.3118 \cdot 100 + 0.2513 \cdot 80 + 0.2763 \cdot 60 + 0.1236 \cdot 40 + 0.0252 \cdot 20 = 73.31 \]

Finally, the total grade of brand equity for brand A is \( Z = W \cdot Z_k = \sum_{k=1}^{4} w_k Z_k = 73.10 \).

### 4 Conclusion

This paper establishes an evaluation model of brand equity from customer perspective based on fuzzy mathematics, and gives a numerical illustrative example. Through the evaluation of individual factor and integrated brand equity, organizations can know more clearly their brand status in market. It can be a guide for organizations to manage marketing resource to enhance brand equity. Meanwhile, as in any study, further research is needed to replicate and extend our method.

### References


