

## Research on Evaluation Index System for Automobile Enterprise Brand Value

Chen Zhaohui, Li Jing

School of Management, Guangxi University of Technology, Liuzhou, P.R. China, 545006

(E-mail: chance168@163.com, sarajing333@126.com)

**Abstract:** This article unifies the brand value theory and analytic hierarchy process to set up an evaluation index system for automobile enterprise brand value through market value, consumer value, environmental value, brand quality and technology innovation value. The empirical analysis shows that brand quality and technology innovation value indicators reside in the first place among the evaluation system, and technology innovation is always an important condition of the long-term development of the enterprise. Second, automobile enterprise should have a higher consumer value, possess extensive consumer market. At the same time, brand environmental value and problem-solving ability should be analyzed.

**Key words:** Automobile enterprise; Brand value; AHP; Evaluation index system

### 1 Introduction

In the trend of economic globalization, the consumer market has entered the brand era, the enterprise competition make brand occupies more and more important role. According to McKinsey report, in *Fortune*, the former 250 big companies have nearly 50% of the market value from brand of intangible assets and function.

In relation to the influence factors of the brand value, western scholars have different point, which can be concluded to enterprise assets value theory, the brand value theory under the consumer's angle of vision and the brand value theory under stakeholder's view. In the case of the enterprise assets value theory, Biel (1992), Crimmins (1992), Shocker and Weitz (1993), Baldinger and Rubinson (1996), Upshaw (2001), Aaker (2005) and other scholars believe that brand value comes from the value of the assets or financial value. It is a kind of exceeding production, commodity and all of tangible asset value, which will bring the non-brand premium profit form product sales to enterprise and directly affect the enterprise currency value. The theoretical viewpoint that the brand value comes from the profit, the first one comes from enterprise financial assets to manifest the brand value or brand assets; the second one comes from enterprise (or shareholders) value.

From the brand value theory under the consumer's angle of vision, Keller (1998), Richard (2004), Hongbumm and WooGon (2005), Berthon (1999), Kotler (1999), Perry (2002), Achenbaum (1993), Arnold (1992), Gronroos (2000) think that brand value comes from the relationship between the brand and the consumer, mainly be related to consumer's knowledge on brand awareness, brand image and brand loyalty, brand perception quality, etc. The brand value theory under the consumer's angle of vision is determined by the consumer, and consumers' emotion decided a brand's fate.

From the brand value theory under stakeholder's view, Winkler (2000), Duncan (2000), Schultz (2004), Hutton (2005), Foley (2006), Jones (2005), Heskett (2003) and other scholars insist that brand value not only comes from the enterprise and the consumer, and with the development of a service economy, trade and information networks, the brand value but also comes from the relationship between brand and other stakeholder. Brand value is the stakeholder brand value of the multi-angle system, the relationship between the stakeholders reflects the essence of the brand, and completely reflects the source of the brand value.

In domestic literature, scholars have different views on the source and compose of the brand value. Zhang Shu Lin (2000) think that the essence of the brand value is brand power, brand value sources is formed with enterprise source and consumer source. Fan Xiu Cheng (2000) points out that brand brings future income to the enterprise, which depends on the consumer's future purchase intention and behavior, and this purchase intention and behavior which depends on the brand psychological impact on consumers. Ming Yang (2002) thinks that brand value is based on the correct brand positioning to obtain the consumers' favor to gain more market profits assets. Wang Xin Xin (2004) think that brands include not only the exchange relations but also objects and other social relations, such as enterprise and consumer motional relationship. According to "differential rent" theory and commodity duality analysis of the source of the brand value Wang Cheng Rong, Zou Shan Gang (2005) think that the brand value

depends on the special labor input and Market acceptance of the fit. Ches Jun Wu, Wan Di Fang (2006) points out the source of brand values are of two types: emphasize cognitive domain and stressed that the cognitive domain and behavior. Wang Miao Ying (2007) summarizes the three main sources of brand value: customers, employees and stakeholders. Wang Xing Yuan (2007) pointed out that with the increasingly diversification of the brand connotation, formed a complex system as the center of the brand, mainly includes enterprise supplier, traders, consumers, competitors, media, government, etc. Zhang Yan (2008) pointed out, in the sources of brand value analysis, stakeholder is a compatible system but not a negation of the enterprise and the consumer, it represents the inevitable trend of brand theory development and of brand practice.

## 2 Construct the Automobile Enterprise Brand Value Evaluation System

### 2.1 Index selection of automobile enterprise brand value evaluation

In numerous factors, according to the relevant investigation and analysis, we have chosen four factors—Brand market value, Brand consumer value, Brand environmental value, Brand quality and technology innovation value, they constitute the first-level indexes of automobile enterprise brand value Evaluation System. Based on the first-level indexes analysis, we have chosen eighteen factors into the second-level indexes; thereby construct the model of Evaluation System index for Automobile enterprise brand value (Table 1). The model is arranged in a hierarchical three: the first is objective layer (A), the second is the criteria layer (B), the third is alternatives layer (C).

### 2.2 Data and methodology

Determine the weight of evaluation factors, the very important next step, after we have constructed the Evaluation system. In order to ensure the weight more scientific and accurately, we will using the Analytic Hierarchy Process (AHP).

#### 2.1.1 Constructing pairwise comparisons

From the hierarchical structure model layer 2, belong to (or influence on a layer of each factors), the same layer opposite factors with comparative tectonic judgment matrix. As for the evaluation criteria with A, n elements of the judgment matrix. Will the elements of each zone by Delphi method to construct the every judgment matrix. The judgment matrix is shown in Table 2..

**Table 1 Evaluation System Index for Automobile Enterprise Brand Value**

Objective Layer(A)	Criteria Layer(B)	Alternatives Layer(C)
Automobile enterprise brand value	Brand market value(B1)	Market Share(C1)
		Market Coverage(C2)
		Sales profit(C3)
		Profit rate(C4)
		Brand Life Cycle(C5)
	Brand consumer value(B2)	Preceived Quality(C6)
		Brand Loyalty(C7)
		Brand Positioning(C8)
		Brand Image(C9)
		Brand Awareness(C10)
		Brand Association(C11)
	Brand environmental value(B3)	Economic Environment(C12)
		Political and Legal Environment(C13)
		Brand Competitiveness Environment(C14)
	Brand quality and technology innovation value(B4)	Brand Products and Service(C15)
		Brand Quality Decision(C16)
		Patents(C17)
		Intellectual property protection ability(C18)

Using pairwise comparisons and a 9-point system ranging from 1 (the two choice options are equally preferred) to 9 (one choice option is extremely preferred over the other) from the criteria layer

and alternatives layer. The 9-point scale used in the AHP studies (Table 3).

**Table 2 Judgment Matrix**

A	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	...	A <sub>i</sub>
A <sub>1</sub>	A <sub>11</sub>	A <sub>12</sub>	A <sub>13</sub>	...	A <sub>1i</sub>
A <sub>2</sub>	A <sub>21</sub>	A <sub>22</sub>	A <sub>23</sub>	...	A <sub>2i</sub>
⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮
A <sub>j</sub>	A <sub>j1</sub>	A <sub>j1</sub>	A <sub>j3</sub>	...	A <sub>3i</sub>

**Table 3 The Saaty Rating Scale**

Intensity	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Moderate importance of one over another	Experience and judgment favor one favor another
5	Essential or strong importance	Experience and judgment strongly favor one favor over another
7	Very strong importance	An factor is strongly favored and its dominance demonstrated in practice
9	Extreme importance	The evidence of favoring one factor over another is of the highest order of affirmation
2,4,6,8	Intermediate values when compromise is needed	

2.2.2 Calculating the priorities and consistency

We calculate the maximum characteristics root and eigenvector then check their consistency. If the test pass, the eigenvector (normalized) is weight vector; otherwise we need to reconstruct the matrix of pairwise comparison.

Calculating the priorities. The basic premise of the Analytic Hierarchy Process is that measurement evolves out of pairwise comparison. Let us from the matrix of pairwise comparison of weights. The formula is calculated the eigenvector ( $W$ ) of vector ( $W_i$ ):  $W_i = (\prod_{j=1}^n a_{ij})^{1/n}$  ( $i = 1, 2, \dots, n$ ). Let us use  $W_A = \sum_{i=1}^n W_i$

to make the vector ( $W_1, W_2, \dots, W_n$ ) normalization. Then use  $W_i^0 = \frac{W_i}{W_A}$  to obtain the weights  $W_i^0$ . We

can now show that be can use  $AW = \lambda_{max} W_i$  to obtain an estimate of the Eigen value of maximum  $\lambda_{max}$ .

Calculating the consistency. The CI value is calculated by using the formula:  $C.I = (\lambda_{max} - N) / (N - 1)$ . If the C.I is smaller, the consistency is better. The CI is equal to 0 the judgments are trustworthy. Next the consistency ratio CR is obtained by dividing the CI value by the Random Consistency index (R.I) as given in table 4.

**Table 4 R.I Values for Different Values of N**

N	1	2	3	4	5	6	7	8	9	10
R.I	0.00	0.00	0.58	0.89	1.12	1.24	1.36	1.41	1.45	1.49

2.2.3 Calculating the aggregation and consistency

The last step is to synthesize the local priorities across all criteria in order to determine the global priority. If pass, we can make a decision according to the aggregation of weight vector; otherwise we need to reconstruct the model. The formula is  $C = \sum_{j=1}^m B_j C_j^i$  ( $j=1, 2, n$ ).

**3 A Numerical Example**

We determined this judgment matrix through the comparison of the comprehensive survey and expert consultation. The analysis of first-class, second-class and comprehensive index as given in table

5-10.

**Table 5 Overall Relative Priority Weights and C.R of Four Criteria**

A	B1	B2	B3	B4	Wi <sup>0</sup>	$\lambda_{max}$
B1	1.0000	2.2255	1.8221	0.5488	0.2849	4.2513
B2	0.4493	1.0000	2.2255	1.2214	0.2452	
B3	0.5488	0.4493	1.0000	0.3012	0.1218	
B4	1.8221	0.8187	3.3201	1.0000	0.3480	
C.I	0.0838<0.1		C.R		0.0745<0.1	

**Table 6 Relative Priority Weights and C.R of Criterion B1**

B1	C1	C2	C3	C4	C5	Wi <sup>0</sup>	$\lambda_{max}$
C1	1.0000	1.8221	1.4918	1.2214	1.8221	0.2773	5.0529
C2	0.5488	1.0000	1.2214	1.4918	1.8221	0.2181	
C3	0.6703	0.8187	1.0000	0.8187	1.4918	0.1786	
C4	0.8187	0.6703	1.2214	1.0000	1.8221	0.2014	
C5	0.5488	0.5488	0.6703	0.5488	1.0000	0.1246	
C.I	0.0133<0.1			C.R		0.0118<0.1	

**Table 7 Relative Priority Weights and C.R of Criterion B2**

B2	C6	C7	C8	C9	C10	C11	Wi <sup>0</sup>	$\lambda_{max}$
C6	1.0000	1.2214	0.8187	0.6703	1.4918	1.4918	0.1696	6.0558
C7	0.8187	1.0000	0.6703	0.5488	1.8221	1.8221	0.1587	
C8	1.2214	1.4918	1.0000	0.5488	1.4918	1.4918	0.1813	
C9	1.4918	1.8221	1.8221	1.0000	2.2255	2.2255	0.2704	
C10	0.6703	0.5488	0.6703	0.4993	1.0000	1.2214	0.1137	
C11	0.6703	0.5488	0.6703	0.4493	0.8187	1.0000	0.1063	
C.I	0.0112<0.1				C.R		0.0086<0.1	

**Table 8 Relative Priority Weights and C.R of Criterion B3**

B3	C12	C13	C14	Wi <sup>0</sup>	$\lambda_{max}$
C12	1.0000	1.2214	1.4918	0.4018	3.0401
C13	0.8187	1.0000	0.4918	0.2693	
C14	0.6703	1.4918	1.0000	0.3289	
C.I	0.0201<0.1		C.R		0.0386<0.1

**Table 9 Relative Priority Weights and C.R of Criterion B4**

B4	C15	C16	C17	C18	Wi <sup>0</sup>	$\lambda_{max}$
C15	1.0000	0.6703	0.6703	0.8187	0.1881	4.0654
C16	1.4918	1.0000	2.2255	1.4918	0.3603	
C17	1.4918	0.4493	1.0000	0.6703	0.1977	
C18	1.2214	0.6703	1.4918	1.0000	0.2539	
C.I	0.0218<0.1		C.R		0.0245<0.1	

The CI and CR value is less than 0.1, so the judgments are trustworthy, and the weights value is

acceptable. The weight value of brand market value is 0.2849. The brand consumer value is 0.2452. The brand environmental value is 0.1218. The brand quality and technology innovation value is 0.3480.

**Table 10 Composite Priorities of Criteria and Sub-criteria**

First-class index		Second-class index		
B	Weight	C	Weight	Composite priorities
B1	0.2849	C1	0.2773	0.0790
		C2	0.2181	0.0622
		C3	0.1786	0.0509
		C4	0.2014	0.0574
		C5	0.1246	0.0335
B2	0.2452	C6	0.1696	0.0416
		C7	0.1587	0.0389
		C8	0.1813	0.0445
		C9	0.2704	0.0663
		C10	0.1137	0.0279
B3	0.1218	C11	0.1063	0.0261
		C12	0.4018	0.0489
		C13	0.2693	0.0328
B4	0.3480	C14	0.3289	0.0401
		C15	0.1881	0.0655
		C16	0.3603	0.1254
		C17	0.1977	0.0688
		C18	0.2539	0.0884

So the consistency index:

$$\begin{aligned}
 CR &= \frac{\sum W_i CI_i}{\sum W_i RI_i} \quad (i = 1, 2, 3, 4) \\
 &= \frac{0.2849 \times 0.0133 + 0.2452 \times 0.0112 + 0.1218 \times 0.0201 + 0.3480 \times 0.0218}{0.2849 \times 1.12 + 0.2452 \times 1.26 + 0.1218 \times 0.52 + 0.3480 \times 0.89} \\
 &= 0.0163 < 0.1
 \end{aligned}$$

As the comprehensive consistency established, the index system is reasonable.

## 4 Conclusion

Through the analysis of the four indexes, we can get a conclusion that: First, in the evaluation index system, the brand quality and technical innovation value index in index weights in first place. Among them, the weight value of brand quality decision is 0.3603. Thus; auto enterprise should put brand quality and technological innovation as the key to promote the brand value. Second, the weight value of brand market value is 0.2849, and brand consumer value is 0.2452. It indicates that an enterprise wants to achieve long-term economic benefit, not only depends on the market, the key depends on the approbation of the consumer. Third, automobile enterprise need to analyze the environmental value to cope with the brand from supply and demand market, political, legal and brand market competitiveness of environmental change. In fact, the brand value enhancement, also to enhance based on the differentiation to competitive advantage; if supplemented by technology innovation strategy, It will make the difference competitions effect more ideal. Therefore, China automobile enterprises are determined to implement differentiation competition strategy.

## References

- [1] Richard G Netemeyer, Balaji Krishnan, Chris Pulliga. Developing and Validating Measures of Facets of Customer-Based Brand Equity[J]. Journal of Business Research, 2004,(57):209-224
- [2] Kim Hongbum, Kim Woo Gon. The Relationship Between Brand Equity and Firms' Performance in Luxury Hotels and Chain Restaurants [J]. Tourism Management, 2005, 32 (8):549-560
- [3] Perry A. Before the Brand: Creating the Unique DNA of an Enduring Brand Identity[M]. New York: McGraw-Hill, 2002:10-15
- [4] Wang Xing Yuan. Brand-name Ecological System Analysis Theory and Management Strategy Research: Based on Ecology from the Perspective of Exploration[M]. Press of Beijing Economic Science, 2007:1-5 (In Chinese)
- [5] Zhang Yan, Zhang Rui, Liu Jing Ping. Brand Value Source and the Theoretical Comments [J]. Forecast, 2010, 05:74-80 (In Chinese)