

Research on Fuzzy Comprehensive Evaluation Based on Competitive Intelligence Enterprise Influence

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ABSTRACT

With the intensification of the competitive market, it is particularly important about how to effectively use competitive intelligence to analyze the current competitive situation of enterprises to improve their influence. This article selects Suning Tesco as the evaluation object. After discussing the analytic hierarchy process and fuzzy comprehensive evaluation method, the fuzzy evaluation of the data obtained by the survey obtained the evaluation scores of Suning Tesco at all levels of indicators, focusing on the analysis of the current problems and challenges facing Suning Tesco in the competitive environment, and gave some suggestions.

Keywords: competitive intelligence, analytic hierarchy process, fuzzy comprehensive evaluation, corporate influence

1. INTRODUCTION

Now, with the intensification of market competition, the era of enterprises mastering core technology and a single monopoly market has passed. American competitive intelligence expert Kirk W.M. Tyson pointed out in the "Complete Guide to Competitive Intelligence": effective Information, analyze the competitive strength of enterprises, so as to formulate and change strategies in time to become the key factor for enterprises to survive and occupy the commanding heights of the industry. Competitive intelligence is thus generated and continues to develop[1]. Driven by computer technology and economic globalization, competitive intelligence has become the fourth core competitive factor for enterprises to participate in market competition after products, funds, and human resources[2].

Competitive intelligence is based on the comprehensive collection of the company's own information, peer and competitor trends, industry chain, market dynamics, technical dynamics, policies and regulations, and international market information, through the collection, processing, analysis, production, and dissemination of information intelligence. To assess the development trend of the industry competition in which the enterprise is located, adjust the structure of the corresponding industry, provide data support for the enterprise to make correct decisions, and dominates in the industry environment [3]. Therefore, in the face of today's competitive environment, it is particularly important for each B2C e-commerce platform to stand out from the competition.

This article takes Suning Tesco as an example, and wants to evaluate its influence through the analytic hierarchy process and the fuzzy comprehensive evaluation method, and reflects the current business operation and

development status through the evaluation score to help improve its own influence

2. BRIEF DESCRIPTION OF THE MODEL

2.1. AHP and Weight of Indicators

2.1.1. Construct a Judgment Matrix

The information foundation of the analytic hierarchy process is the qualitative judgments given by people on the relative importance of each index in each layer[4]. By introducing appropriate scales, the qualitative judgments are quantitatively described by numerical values to obtain the judgment matrix. The comparison of the relative importance index between the factors in the previous layer and the factors related to this layer. Assuming that the M layer factors are related to the C in the next layer, the judgment matrix will be constructed as shown in the

$$M = [C_{ij}] = \begin{bmatrix} C_{11} & C_{12} & \cdots & C_{1n} \\ C_{21} & C_{22} & \cdots & C_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ C_{n1} & C_{n2} & \cdots & C_{nn} \end{bmatrix},$$

following table , In the above matrix, C_{ij} ($i=1, 2, \dots, n; j=1, 2, \dots, n$) represents the importance scale value of the index C_i compared to C_j , for A_k , where C_{ij} satisfies the following relationship .

In order to quantify the index, in this paper, the 1-9 scale method is used. The scale method is relatively clear and has a good distinction.[6]

2.1.2. Weight Vector Calculation and Inspection

This paper uses the total method to calculate the weight vector, which is the column vectors are first normalized, then the new matrix is summed, and finally the normalization is performed to obtain the weight vector. The weight W of the index layer is the final normalized weight vector. After calculation by AHP, a consistency test is also required for the results. The test steps are as follows:

Calculating the maximum feature root λ_{max} of the judgment matrix is the first process.

$$A \cdot W = \lambda_{max} \cdot W \quad (1)$$

Among them, A is the original judgment matrix, W is the calculated weight vector.

Calculating the consistency index CI is the second process

: $CI = \frac{\lambda_{max} - n}{n - 1}$. Generally speaking, the larger the CI , the stronger the consistency of the judgment matrix, and the more reasonable the judgment matrix construction is. However, since the judgment matrix may be affected by random deviation, the consistency ratio CR needs to be calculated.

Thirdly, in order to obtain the ultimate measurement of whether the judgment matrix is consistent, calculating the

consistency ratio CR is necessary: $CR = \frac{CI}{RI}$.

The consistency ratio CR is used as a consistency indicator to test whether the judgment matrix passes the consistency test. The smaller the CR value is, the higher the consistency of the judgment matrix. That is, if $CR < 0.1$, the decision matrix satisfies the integrity test; otherwise, if $CR > 0.1$, the judgment matrix is not consistent. After passing the consistency test, the calculated weights are consistent, and the resulting weight vector is the index weights at all levels.

2.2. Fuzzy Comprehensive Evaluation Model

Fuzzy comprehensive evaluation method is based on fuzzy mathematics, applying fuzzy relation synthesis principle, quantifying some fuzzy factors and carrying out comprehensive evaluation. The evaluation steps are as follows.

(1) The establishment of the evaluation target index theoretic domain U , where U_i represents the index to be considered for evaluation.
 $U = \{U_1, U_2, \dots, U_i\} (i = 1, 2, \dots, n)$ (2)

(2) The establishment of evaluation level evaluation set V , where V_j represents the evaluation standard.
 $V = \{V_1, V_2, \dots, V_j\} (j = 1, 2, \dots, n)$ (3)

(3) The establishment of fuzzy evaluation matrix R .

$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m1} & \dots & r_{mn} \end{bmatrix}$. Among them, $r_{ij} \in [0, 1] (i = 1, 2, \dots, m; j = 1, 2, \dots, n)$ represents the

degree of membership of the j -th evaluation of the i -th indicator. The specific calculation formula is as follows:

$r_{ij} = \frac{d_{ij}}{\sum d_{ij}}$. d_{ij} represents the number of people who rated the i -th indicator as the j -th evaluation level.

(4) The index weight W calculated by the analytic hierarchy process is used to perform the synthesis operation of the fuzzy matrix using the weighted average composition operator $M(\cdot, \oplus); B = W \cdot R$

3. EMPIRICAL RESEARCH

3.1. Evaluation index system setting

In order to ensure the scientificity and research on the remaining influence of Suning.com, after browsing and comparing the major e-commerce platforms to establish a system evaluation index system and standards, the results of the comprehensive questionnaire are comprehensive, complete, hierarchical and concise according to the index system[5]. The principle is to establish the following three-level indicators, as follows.

Table 1 Index system table

First-level indicators	Secondary indicators	Third-level indicators
Corporate influence	Website design	page design
		user experience
		Information exchange
	Service index	Rights Protection
		Merchant service quality
		Platform service quality
		Logistics service quality
	Technical index	Consumer payment
		Platform search
		system security
		Other technologies
	Product index	Category completeness
		Product quantity richness
		product quality
		Product self-positioning
		Product discount
	Marketing metrics	Product updates
		Customer Loyalty
		Brand
		Member information push
Information index	Information index	Promotion policy
		Information form
		Information quality

	information update
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3.2. Calculation of Evaluation Index Weight

Taking a second-level index website design as an example, an index decision matrix is constructed. The purpose of analyzing different levels is the decision-making of weights between the interface design, user experience, and interface interaction of the subordinate three-level index. The judgment matrix A_1 is as follows:

$$A_1 = \begin{bmatrix} 1 & 1/3 & 1/4 \\ 3 & 1 & 1/3 \\ 4 & 3 & 1 \end{bmatrix}$$

Use the sum product method to calculate the judgment matrix, and obtain the normalized weight vector $W_1 = [0.120, 0.272, 0.608]$ of each factor of the judgment matrix A_1 . After calculation, this judgment matrix $\lambda_{max} = 3.074$, after consistency test, random consistency ratio $CR = 0.071 < 0.1$, with acceptable consistency.

Similarly, according to the above analysis method, based on the data obtained from the survey, the weight vector W_0 of the six types of indicators under the second-level indicators in the index system table, and the services, technologies, products, marketing, and information indicators under the third-level indicators can be calculated. Level index weight vector W_2, W_3, W_4, W_5, W_6 , each weight vector has passed the consistency test, and after normalization are:

$$W_0 = [0.056, 0.385, 0.103, 0.257, 0.155, 0.044]$$

$$W_2 = [0.455, 0.081, 0.175, 0.289]$$

$$W_3 = [0.196, 0.185, 0.545, 0.074]$$

$$W_4 = [0.102, 0.147, 0.282, 0.040, 0.353, 0.076]$$

$$W_5 = [0.253, 0.485, 0.075, 0.187]$$

$$W_6 = [0.098, 0.568, 0.334]$$

3.3. Evaluation Index System Setting

3.3.1. Evaluation Level and Score

Combined with the questionnaire situation, a rating evaluation set V was established, and the evaluation set was divided into five levels.

3.3.2. Fuzzy Comprehensive Evaluation

Set a total of five grades in the evaluation set, based on 139 valid questionnaires for consumers to evaluate the satisfaction of the third-level indicators, and establish a fuzzy comprehensive evaluation matrix

$$R_1 = \begin{bmatrix} 0.25 & 0.39 & 0.27 & 0.05 & 0.04 \\ 0.14 & 0.32 & 0.40 & 0.10 & 0.05 \\ 0.19 & 0.28 & 0.34 & 0.13 & 0.07 \end{bmatrix} \quad R_2 = \begin{bmatrix} 0.20 & 0.24 & 0.40 & 0.12 & 0.04 \\ 0.11 & 0.31 & 0.32 & 0.12 & 0.14 \\ 0.16 & 0.36 & 0.36 & 0.08 & 0.05 \\ 0.13 & 0.45 & 0.23 & 0.09 & 0.10 \end{bmatrix}$$

$$R_3 = \begin{bmatrix} 0.08 & 0.19 & 0.44 & 0.21 & 0.09 \\ 0.21 & 0.32 & 0.29 & 0.16 & 0.03 \\ 0.41 & 0.19 & 0.24 & 0.15 & 0.02 \\ 0.19 & 0.58 & 0.15 & 0.04 & 0.04 \end{bmatrix} \quad R_4 = \begin{bmatrix} 0.18 & 0.20 & 0.30 & 0.20 & 0.12 \\ 0.24 & 0.26 & 0.30 & 0.11 & 0.09 \\ 0.31 & 0.24 & 0.29 & 0.10 & 0.06 \\ 0.42 & 0.25 & 0.27 & 0.04 & 0.02 \\ 0.32 & 0.30 & 0.26 & 0.11 & 0.01 \\ 0.34 & 0.29 & 0.23 & 0.09 & 0.06 \end{bmatrix}$$

$$R_5 = \begin{bmatrix} 0.19 & 0.23 & 0.38 & 0.13 & 0.06 \\ 0.19 & 0.37 & 0.20 & 0.17 & 0.07 \\ 0.09 & 0.15 & 0.55 & 0.16 & 0.05 \\ 0.23 & 0.27 & 0.27 & 0.14 & 0.09 \end{bmatrix} \quad R_6 = \begin{bmatrix} 0.14 & 0.30 & 0.40 & 0.10 & 0.06 \\ 0.12 & 0.30 & 0.33 & 0.12 & 0.12 \\ 0.11 & 0.18 & 0.47 & 0.15 & 0.09 \end{bmatrix}$$

After the weighted average synthesis operator $M(\cdot, \oplus)$ is used to synthesize the fuzzy matrix, the results of the first-level fuzzy comprehensive evaluation of various third-level indicators are:

$$B_1 = W_1 \cdot R_1 = [0.19 \ 0.30 \ 0.35 \ 0.11 \ 0.06]$$

$$B_2 = W_2 \cdot R_2 = [0.17 \ 0.33 \ 0.34 \ 0.10 \ 0.07]$$

$$B_3 = W_3 \cdot R_3 = [0.29 \ 0.24 \ 0.28 \ 0.15 \ 0.04]$$

$$B_4 = W_4 \cdot R_4 = [0.29 \ 0.27 \ 0.28 \ 0.11 \ 0.05]$$

$$B_5 = W_5 \cdot R_5 = [0.19 \ 0.30 \ 0.29 \ 0.15 \ 0.07]$$

$$B_6 = W_6 \cdot R_6 = [0.11 \ 0.26 \ 0.39 \ 0.12 \ 0.11]$$

According to the results of the first-level fuzzy evaluation, the second-level fuzzy evaluation is conducted. After the new matrix is constructed, the second-level fuzzy comprehensive evaluation is performed.

$$R_0 = [B_1 \ B_2 \ B_3 \ B_4 \ B_5 \ B_6] \\ B_0 = W_0 \cdot R_0 = [0.21 \ 0.29 \ 0.32 \ 0.12 \ 0.06] \quad (4)$$

(3) Calculate evaluation score

The calculation process of its comprehensive score is as follows: $G_0 = 0.21 \times 5 + 0.29 \times 4 + 0.32 \times 3 + 0.12 \times 2 + 0.06 \times 1 = 3.47$. In the same way, the scores of each of the second-level indicators are obtained, and the scores are as follows:

Table 2 Scores of each secondary indicator

Websi te	Servi ce	Techni cal	Produ ct	Marketi ng	Informati on
3.48	3.46	3.59	3.52	3.39	3.11

4. COMPETITIVE INTELLIGENCE CONCLUSION

4.1. Service System

As an emerging e-commerce platform, Suning.com uses its offline store advantages to rapidly develop e-commerce, but its service system still has a certain gap with similar e-commerce market players, such as Tmall and JD. Among the service indicators, equity protection and logistics system indicators account for a relatively large proportion, but Suning Tesco does not perform well. In terms of logistics, Tmall utilizes its powerful rookie network for logistics storage and rapid transshipment, and JD.com has developed its JD logistics, which has significant advantages in delivery speed and package security. Logistics can be achieved on the same day. The Suning has obviously insufficient performance in logistics and does

not have sufficient mature logistics system support. In terms of rights and interests protection and platform service quality, there are certain consumers who buy online but cannot protect their consumers' rights and interests offline, and cannot effectively use their online and offline business advantages. At the same time, the efficiency of online customer service is low. As a channel to enhance user experience, customer service is essential for real-time online communication. However, in its website services, customer service has certain information lag, uncertain information, low communication efficiency, and randomness of feedback information and other issues.

4.2. Marketing System

As the threshold for e-commerce is lower than that for traditional business models, there are more and more online stores, and Suning Tesco shows the overall lack of online marketing and insufficient corporate publicity. Most of its marketing methods are concentrated on its own websites and offline stores. It has not fully grasped the opportunities brought by the "big data" era to corporate marketing. In essence, Suning Tesco's online marketing is not integrated with the company's entire business process. Similar companies Tmall Taobao, use its Weibo account to seize the opportunity to seize hot spots, and carry out various forwarding activities; unite with major e-commerce enterprises to carry out substantial forwarding sweepstakes on special holidays; The Tiktok account cooperates with various internet celebrities in the shortvideo to "sell goods" to achieve marketing purposes. In addition, in its brand image construction, Suning Tesco did not bring brand benefits to consumers. Under the prospect of Tmall to create Double 11 and JD.com to build 618 platform promotion market, Suning Tesco does not have its distinctive brand features. And its information resources construction is relatively low, which hinders the construction of its brand image.

4.3. Evaluation Index System Setting

Suning Tesco's target users are mainly targeted at Internet users of 3C products in large and medium-sized cities. As the urban market is becoming saturated, with the stability of the entire home appliance industry market, the contradiction of oversupply of home appliance products is becoming increasingly prominent. In terms of product system construction, Not only limited to 3C products, but also to cooperate with major domestic and foreign companies to expand the product range and retail product range, only limited to 3C products, its competitiveness and influence will be insufficient. In terms of price, the existing larger competitors mainly include Gome and Sanlian. Suning.com faces the challenges of retail giants, but most of its products in the online mall do not have a price advantage. Only a few hot-selling products are similar to JD.com and Newegg. The professional B2C

website is flat, and it is difficult to synchronize prices online and offline across the country. There is not enough price advantage in the B2C industry. Many e-commerce companies of the same kind fight together. With its powerful marketing model, it leads the market in price, and the market share gradually increases every year. There is a certain lag in product updates and supplier shortages. When major mobile phone manufacturers release their current new products, Tmall and JD.com are mostly sold at the same time, while Suning Tesco needs to implement the supplier after the sell.

ACKNOWLEDGMENT

This project is one of the research achievements of the Hohai University College Student Innovation and Entrepreneurship Training Project (Project Number: 2019102941388)

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