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RESEARCH ON COMPREHENSIVE EVALUATION OF FOOD ENTERPRISES WEBSITES

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Abstract

The importance of enterprise website to promote enterprise development is becoming more and more attention by the small and medium-sized enterprises. This paper establishes an evaluation index system of food enterprises websites from the perspective of user experience based on the websites localization and the current literature, and uses analytic hierarchy process to determine the weight of each level index, and establishes the fuzzy comprehensive evaluation model of food enterprises websites, and carries out a case study with the evaluation index system. The case study shows that it is reasonable and credible to evaluate the food enterprises websites with analytic hierarchy process and fuzzy comprehensive evaluation.

1 Introduction

With the rapid development of Internet commercialization, a large number of enterprises websites have emerged. The high quality website is very important for enterprise to succeed in e-commerce activities. Enterprise website will be beneficial to set up enterprise image, improve enterprise popularity; and to develop marketing channels, and expand market, improve marketing efficiency; and to understand the opinions of customers, grasps the demands of customers; and to improve service quality, raise service level; and to optimize enterprise business processes, improve the level of enterprise informationization and management.

In the fierce market competition, enterprises urgently need for an evaluation index system and assessment method to use as the basis of maintenance, update, further development and improvement of enterprises websites. Through the evaluation of enterprise website, business operators can be more objective and comprehensive understanding of the actual operation effect and customer satisfaction of enterprises websites, and understanding of the status, advantages and disadvantages of enterprises websites. How to adopt a reasonable and reliable evaluation method of enterprises websites for scientific evaluation to improve e-commerce application level and informatization construction of SMEs has become

a research focus of e-commerce application field.

Now, the food industry has become the largest industry in the world, and it is also a new growth point of the national economy development in China. As the fast development of food industry and Internet, the development situation and trend of food enterprises websites has attracted increasing attention.

This paper establishes an evaluation index system of food enterprises websites from the aspects of website design, website content, website service and function, website operation effect based on the websites localization and the current literature, and uses analytic hierarchy process to determine the weight of each level index, and establishes the fuzzy comprehensive evaluation model of food enterprises websites. Finally we apply the evaluation index system to case study by choosing one of the food enterprises websites, as the object for evaluation.

2 Literature Review

Now, many scholars conducted research on evaluation of enterprises websites from different perspectives. Most research perspectives on the topic could be summarized as follows:

One of the perspectives is based on the index system of website evaluation. More representative evaluation index was proposed from the perspective of customer satisfaction by Gomez, BizRate, National Consumers League Website[1-3]. Some Chinese scholars[4-6] also studied the evaluation index system of enterprises websites.

The second perspective is based on the content of website evaluation. The content of website evaluation mainly involved website content[7-8], website usability[9], website user's satisfaction[10], website quality and service quality[11-14], website trustiness degree[15], website promotion strategy[16], etc.

The third perspective is based on the methods of website evaluation. The methods of website evaluation mainly included the artificial neural network[17], the analytic hierarchy process[18-21], and the fuzzy comprehensive evaluation[22], the webometrics[23], the software real-time

monitoring[24], etc.

In summary, although there were some results of the evaluation research on enterprises websites, they did not form a unified view and standards. This paper will establish an evaluation index system of food enterprises websites based on user experience of enterprises websites in order to promote the implementation of e-commerce application and informatization construction, and to enhance the competitiveness of enterprises.

3 Construction of Evaluation Index System

The food industry in China has some characteristics, such as low concentration, high proportion of SMEs, low technical level, serious homogeneity, intense competition between enterprises, and so on. Thus, when the evaluation of food enterprises websites is carried out, in order to fully examine whether the construction of enterprise website matches the resources, environment, objectives and strategies of enterprise, we should not only consider the indexes of technique and content, but also consider the indexes of website design and operation effect.

The user experience is that the user's done, thought, feeling when users use of a product or a service, it refers to the user's rational value and perceptual experience which provided by the product and the service[25]. The user experience is the objective reflection which the users interact with the website, it asks for user-centered to construct and evaluate enterprises websites.

Based on the principles of establishment of evaluation index system, consistency of index with evaluation goal, compatibility of indexes in the same system, relative independence of each evaluation index, measurability, integrity and feasibility, we design an evaluation index system of food enterprises websites from the perspective of user experience, as shown in Table 1.

According to the requirements and the researches on evaluation of food enterprises websites, we determine the one-level evaluation indexes of food enterprises websites from the following aspects:

Website design

The index of website design should be evaluated from page design, information classification, navigation design and link design. The meaning of the index is as follows:

Page design: The page design of enterprises websites should be artistic, and the layout and color matching of enterprises websites should have

novelty and personality.

Information classification: The information classification of enterprise website should be scientific, and the columns of enterprise website should have rationality.

Navigation design: The hierarchical structure of enterprise website should be reasonable, and the navigation framework of enterprise website should be clear.

Link design: The links quality of enterprise website should be high, and there should not be an error or invalid links.

Table 1 Evaluation Index System of Food Enterprises Websites

One-level indexes	Weight	Two-level indexes	Weight
Website design	0.1000	Page design	0.1725
		Information classification	0.4225
		Navigation design	0.2700
		Link design	0.1350
Website content	0.4427	Information sources	0.1634
		Information value	0.5396
		Information compiling quality	0.2970
Website service and function	0.2711	Information management	0.4203
		Website interactivity	0.1213
		Products search	0.1899
		Customer service	0.2685
Website operation effect	0.1861	Website accessibility	0.4934
		Website popularity	0.1958
		Website stability and security	0.3108

Website Content

The index of website content should be considered from information sources, information value and information compiling quality. The meaning of the index is as follows:

Information sources: The information source of enterprise website should have higher reliability, and the information of enterprise website should have higher authority.

Information value: The information content of enterprise website should be true, accurate, comprehensive and timeliness.

Information compiling quality: The compiling quality of information content of enterprise website should be normative, explicit and concise.

Website Service and Function

The index of website service and function should be assessed from website interactivity, information management, products search and customer service. The meaning of the index is as follows:

Information management: The various information of enterprise website should be managed with management system.

Website interactivity: The enterprise website should offer a variety of interactive methods to facilitate communication between enterprises and customers.

Products search: The enterprise website should provide various search methods for users to inquiry products quickly.

Customer service: The enterprise websites should provide service functions for customer, such as business promotion, consulting services, etc.

Website Operation Effect

The index of website operation effect should be appraised from website popularity, website accessibility, website stability and security. The meaning of the index is as follows:

Website accessibility: The enterprise website should be visited and used easily by users.

Website popularity: The enterprise website should have bigger influence in the food industry.

Website stability and security: The security and stability of enterprise website should be protected with a variety of safe technology.

4 Comprehensive Evaluation Method

In order to avoid the effect of individual subjective judgment and favoritism on the evaluation result of food enterprises websites, this paper uses analytic hierarchy process[26] to determine the weight of each level index, and utilize fuzzy comprehensive evaluation method[27] to assess the food enterprises websites.

4.1 Analytic Hierarchy Process

Establishment of Factor Set

Factor set is made up of elements that affect the judgment objects. According to the analysis above, there are fourteen single factors affecting food enterprises websites, and they can be divided into two tiers. The factor set can be established as $U=\{U_1, U_2, U_3, U_4\}$, and the single-factor sets are:

$$U_1=\{u_{11}, u_{12}, u_{13}, u_{14}\}$$

$$U_2=\{u_{21}, u_{22}, u_{23}\}$$

$$U_3=\{u_{31}, u_{32}, u_{33}, u_{34}\}$$

$$U_4=\{u_{41}, u_{42}, u_{43}\}$$

U_1, U_2, U_3, U_4 respectively represents the four one-level indexes, that is, website design, website content, website service and function, website operation effect.

Establishment of Weight Set

Every factor has different importance degree. To reflect the differences, every factor U_i is endowed with corresponding weight w_i . And the set $W=\{w_1, w_2, \dots, w_n\}$ which consists of weights is called factor weight set.

Establishment of the comparison judgment matrix

First, complex problems break down into several elements and different elements are divided into several groups. Then we establish a multi-level evaluation model based on the group status. Membership between the up-down hierarchy members is determined after we establish the multi-level evaluation model. We carry out the pairwise comparison between elements in each hierarchy of the multi-level model for the correlative up-level element, and then establish a series of judgment matrixes. According to Table1, we structure the comparison judgment matrix of the one-level indexes as follows:

$$G = \begin{bmatrix} 1 & 1/4 & 1/3 & 1/2 \\ 4 & 1 & 2 & 2 \\ 3 & 1/2 & 1 & 2 \\ 2 & 1/2 & 1/2 & 1 \end{bmatrix}$$

Calculation of elements' relative weights in single criterion

This paper uses characteristic root method to compute collating weight vector. We suppose that the max characteristic root of judgment matrix G is λ_{\max} , and the corresponding characteristic vector is W . The methods of W and λ_{\max} are as follows:

$$w_i = \sqrt[n]{\prod_{j=1}^n b_{ij}} / \sum_{i=1}^n \sqrt[n]{\prod_{j=1}^n b_{ij}} \quad (i=1, \dots, n) \quad (1)$$

$$\lambda_{\max} = \sum_{i=1}^n \frac{\sum_{j=1}^n b_{ij} w_j}{n w_i} \quad (i=1, \dots, n) \quad (2)$$

Based on Equation (1) and (2), we calculate and get the λ_{\max} and W of comparison judgment matrix G :

$$\lambda_{\max} = 4.1192$$

$$W = (0.1000, 0.4427, 0.2711, 0.1861)$$

W is the weight set of one-level elements for the general goals.

Consistency check

To make sure that the decision-making process is scientific, consistency check of λ_{\max} is necessary.

Checking process is as following:

$$CI = (\lambda_{\max} - n) / (n - 1) \quad (3)$$

$$CR = CI / RI \quad (4)$$

In the Equation (3) and (4), CI stands for coincidence index, CR represents coincidence rate and RI is random coincidence index.

When $CR < 0.1$, we consider that judgment matrix has a good consistency, or else we should adjust the values of elements in judgment matrix.

Based on Formulation (3), we calculate and get CI of comparison judgment matrix G : $CI=0.0397$, when $n=4$ and $RI=0.90$.

Based on Formulation (4), we calculate and get CR of the comparison judgment matrix G : $CR=0.0442 < 0.10$. This indicates that the judgment matrix has a satisfying consistency.

Similarly, we can establish the judgment matrixes of two-level elements for correlative one-level elements, and also calculate all weights of evaluation indexes of food enterprises websites, as shown in Table 1.

Calculation of combination weight of each level element

To get the weights of all elements of each level for the overall objective, it is necessary to judge the value of CR . If $CR \geq 0.1$, we should assemble the calculation results of the third step properly and check the total judgment consistency. We do this step basipetally. The final results indicate the relative weight of decision-making priority

sequence and the judgment consistency check of the whole hierarchical model.

According to the relative weight, we can calculate and get combination weight of fourteen evaluation indexes: $W = (0.0172, 0.0423, 0.0270, 0.0135, 0.0723, 0.2389, 0.1315, 0.1139, 0.0329, 0.0515, 0.0728, 0.0918, 0.0364, 0.0578)$.

4.2 Fuzzy Comprehensive Evaluation Method

Establishment of Evaluation Set

Evaluation set is made of all kinds of total judgment results given by judges as elements. The evaluation set V of the high-quality course website in universities can be established as $V = \{V_1, V_2, V_3, V_4, V_5\}$, in which five evaluation results are excellent, good, moderate, common and bad.

Establishment of Evaluation Matrix

First, experts evaluate from the single element of factor set U and determine the degree of membership that the evaluation objects rely on the elements of factor set. Then, we establish the total evaluation matrix consisting of evaluation sets of n elements. It is usually expressed as R .

Fuzzy Comprehensive Evaluation

After we get values of W and R , we can do fuzzy mapping to have a comprehensive judgment. The mathematical model of fuzzy comprehensive evaluation is shown as:

$$B = W \cdot R = (v_{b1}, v_{b2}, \dots, v_{b5}) \quad (5)$$

5 Evaluation Example

5.1 Case Evaluation

The Huaxin noodle factory in Henan province of China is an agricultural product processing enterprise, its main business include the sales of noodles, flour sales and second powder, wheat bran and other by-products. The independent enterprise website has been developed, and the enterprise online store has been established in the third party platforms, such as www.hc360.com, www.mymai.org, etc.

The independent website address of Huaxin noodle factory is <http://www.sc362.com>. Now, in order to understand user satisfaction of the enterprise website, and to further improve the utilization of enterprise website, we have organized five enterprise personnel and five enterprise clients to evaluate the construction of enterprise website based on the above evaluation index system. According to the test data of enterprise website of

Huaxin noodle factory, we establish evaluation matrix R , as shown in Table 2.

Table 2 Evaluation Matrix R of Enterprise Website of Huaxin Noodle Factory

	V_1	V_2	V_3	V_4	V_5
Page design	0.1	0.2	0.4	0.3	0
Information classification	0	0	0.5	0.4	0.1
Navigation design	0.1	0.1	0.4	0.4	0
Link design	0	0.2	0.4	0.3	0.1
Information sources	0.1	0.3	0.4	0.2	0
Information value	0	0.2	0.4	0.3	0.1
Information compiling quality	0	0.2	0.3	0.4	0.1
Information management	0	0.2	0.3	0.4	0.1
Website interactivity	0	0.3	0.4	0.2	0.1
Products search	0.1	0.2	0.5	0.2	0
Customer service	0	0.2	0.4	0.3	0.1
Website accessibility	0	0.1	0.4	0.3	0.2
Website popularity	0	0.2	0.4	0.3	0.1
Website stability and security	0	0	0.5	0.3	0.2

Based on Equation (5), we can calculate and get the comprehensive judgment of enterprise website of Huaxin noodle factory: $B=(0.0168, 0.1922, 0.3986, 0.2995, 0.0926)$.

According to the principle of maximum degree of membership, the maximum degree of enterprise website of Huaxin noodle factory $\max(b_i)=0.3986$, which shows that enterprise website of Huaxin noodle factory is the third level, namely, that is moderate.

5.2 Improvement Suggestion

Although enterprise website of Huaxin noodle factory promoted enterprise image, set up the enterprise brand and increase enterprise sales, it had some problems: the information content of website is less, the column structure of website is simple, and the content updating is lap, and the interaction between enterprise and customers is

lack, and the product promotion and website promotion is inadequate.

To solve these problems, some corresponding suggestions are proposed for Huaxin noodle factory: the marketing and service should be strengthened, and the website content should be updated on time, and the website should be maintained regularly, and the website functions should be optimized.

6 Conclusion

Base on the perspective of user experience, this paper establishes an evaluation index system of food enterprises websites from the aspects of website design, website content, website service and function, website operation effect, and adopts the method of analytic hierarchy process and fuzzy evaluation to establish the fuzzy comprehensive evaluation model of food enterprises websites. Finally the evaluation index system is applied to empirical study.

According to the results, fuzzy comprehensive evaluation is a reasonable and feasible method to evaluate food enterprises websites, and it can be used widely in the evaluation of food enterprises websites. This evaluation index system will contribute to guiding the construction and use of food enterprises websites, and it has practical significance to promote the development of food industry, and it has certain reference to evaluate enterprises websites of other industries.

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