

Research on Information Quality Evaluation of Network Community

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Abstract

With the increasing popularity of the Internet, a large number of network communities have been born. The user generated content based on the Internet is constantly emerging, and the quality of network information is uneven. It is helpful to improve the competitiveness of community websites to evaluate the information quality. This paper constructs the evaluation index system of information quality of network community, determines the weight of each index by AHP, and establishes the information quality evaluation model by using fuzzy comprehensive evaluation method. The research in this paper has reference value for various types of website information quality evaluation.

Key words: *Information Quality; Information Quality; Evaluation*

1 INTRODUCTION

According to the 45th statistical report on China's Internet Development released by China Internet Network Information Center (CNNIC), as of March 2020, the number of Internet users in China has reached 904 million, and the Internet penetration rate is 64.5%.^[1] With the continuous popularization of the Internet, online communities with user generated content as the main information are emerging and becoming one of the main social networking platforms. Information quality has become the core competitive element of the network community. Improving the information quality of the community website helps to improve the user satisfaction and promote the rapid development of the community. Information quality can be interpreted as a true and objective reflection of the basic situation of things, can reflect the value of information, so as to meet the needs of users. Information quality generally includes timeliness, credibility, practicality, etc. Some scholars have done some research on the evaluation of website information quality. For example, LV Youqing et al. (2018)^[2] constructed four first-class indicators including information content, information presentation, media platform and information utility, as well as 13 secondary indicators such as accuracy and security, based on the perspective of users, to evaluate the information quality of social media; Zhang Xiaofan (2019)^[3] evaluated the information quality of user generated content of tourism websites, from the perspective of content quality. From the five dimensions of quantity, reference source, expression level, information utility and emotional experience, the basic framework of evaluation system is constructed. Qian Minghui et al. (2018)^[4] combined with the main characteristics of China's online health consultation platform, constructed an evaluation index system for the information quality of China's online health consultation platform from nine dimensions of authority, attribution, comprehensiveness, complementarity, confidentiality, interactivity, readability, timeliness and advertising integrity. From the existing literature, we can see that the current research in this field seldom takes the network community as the research object, but the network community is an important part of the Internet platform. Therefore, in view of the shortcomings of the above research, this paper constructs the evaluation index system of network community information quality, and on this basis, uses the fuzzy comprehensive evaluation method to construct the information quality evaluation model.

2 EVALUATION INDEX SYSTEM OF NETWORK COMMUNITY INFORMATION QUALITY

2.1 Construction Principle and Formulation Process of Evaluation Index System

This paper follows the principles of "scientific, systematic and hierarchical", and on the basis of referring to the existing literature, combined with the characteristics of the network community, constructs the information quality evaluation index system of this kind of platform. The basic process is as follows:

First, set up a team of experts. In order to ensure the objective research results as far as possible, an expert team with many people is established. The team is mainly responsible for the determination of index items and index weight of evaluation index system. Delphi method is mainly used to determine the index items and weight.

Secondly, on the basis of referring to the existing literature, after determining the evaluation index items, the analytic hierarchy process (AHP) is used to determine the index weight.

2.2 Determination and Meaning of Evaluation Index

According to the construction principle and formulation process of index system in Section 2.1, this paper establishes the evaluation index system as shown in Table 1 [5].

TABLE 1 INFORMATION QUALITY EVALUATION INDEX OF NETWORK COMMUNITY

First level index	Second level index
C ₁ Interface design	C ₁₁ Page design
	C ₁₂ Website navigation
	C ₁₃ Color matching
C ₂ Service information	C ₂₁ Interactive quality
	C ₂₂ Individualization
	C ₂₃ Problem solving
C ₃ Content quality	C ₃₁ Authenticity and accuracy
	C ₃₂ Novelty
	C ₃₃ Richness and comprehensiveness
C ₄ Security	C ₄₁ Account information
	C ₄₂ System safety
	C ₄₃ Running speed

2.3 Description of Indicators

The first level index "interface design" mainly refers to the effect of website page design and information display, which specifically includes the overall situation of page design, the navigation structure of the website and the overall color matching of the website. The website service information mainly refers to the service content of the website to customers; in the network community, the service of the website is reflected in the interactivity, personalization, problem solving, etc. The content Quality mainly refers to the information display in the website, including the authenticity and accuracy of the information, the novelty of the information, and the richness and comprehensiveness of the displayed information; the security mainly refers to the users' perception of the running speed of the website, the security of the account and the overall security of the system in the process of using the community website.

2.4 Determination of Evaluation Index Weight

In this study, AHP is used to determine the weight of indicators. This method was proposed by American operational research scientist, Professor Satty of Pittsburgh University, in the early 1970s. It decomposes the elements that are always related to decision-making into objectives, criteria, schemes and other levels, and then carries out qualitative and quantitative analysis on this basis [6]. The specific steps of AHP are as follows: firstly, establish the judgment matrix, and determine the importance of indicators through consultation among experts. 1, 3, 5, 7, 9 are used to indicate that the indicators are equally important, slightly important, obviously important, strongly important and extremely important, and 2, 4, 6, and 8 are used to indicate that they are between the above-mentioned importance levels. The

corresponding reciprocal is used to indicate the importance of the latter index over that of the former. Taking C₁₁-C₁₃ as an example, the established judgment matrix is shown in Table 2.

TABLE 2 JUDGMENT MATRIX OF C₁₁-C₁₃ INDEXES

	C ₁₁	C ₁₂	C ₁₃
C ₁₁	1	5	3
C ₁₂	1/5	1	1/3
C ₁₃	1/3	3	1

After establishing the judgment matrix, use the following steps to calculate the weight of the index (set the judgment matrix as C)

(1) The product of row I of the matrix is represented by K_i , then:

$$K_1 = 15, K_2 = 1/15, K_3 = 1$$

(2) Let M_i denote the n-th root of $K_i (n = 3)$, then: $M_1 = 2.466, M_2 = 0.405, M_3 = 1$

(3) Normalization treatment (M_1 to M_3), $W_i = \frac{M_i}{\sum_{j=1}^n M_j}$ ($i = 1, 2, \dots, n$), then: $W_1 = 0.637, W_2 = 0.105, W_3 = 0.258$

(4) To judge the consistency, first calculate the largest eigenvalue of the matrix, represented by λ_{max} , then: $\lambda_{max} = \frac{1}{n} \sum_{i=1}^n \frac{(CW)_i}{W_i} = 3.044$. Then, the consistency index value is calculated: $C.I. = \frac{\lambda_{max} - n}{n - 1}$. Finally, consistency is judged. $C.R. = \frac{C.I.}{R.I.} = 0.043$ (When dimension is 3, $R.I. = 0.52$). It can be seen that $C.R. < 0.1$, the weight calculated above is reasonable, that is, the weight of C₁₁-C₁₃ is (0.637, 0.105, 0.258).

According to the same steps above, the weights of C₁-C₄, C₂₁-C₂₃, C₃₁-C₃₂ and C₄₁-C₄₃ can be calculated, as shown in Table 3:

TABLE 3 WEIGHT OF EACH INDEX

First level index	Weight	Second level index	Weight	Combination weight
C ₁ Interface design	0.124	C ₁₁ Page design	0.637	0.104
		C ₁₂ Website navigation	0.105	0.017
		C ₁₃ Color matching	0.258	0.042
C ₂ Service information	0.35	C ₂₁ Interactive quality	0.183	0.046
		C ₂₂ Individualization	0.35	0.088
		C ₂₃ Problem solving	0.467	0.118
C ₃ Content quality	0.429	C ₃₁ Authenticity and accuracy	0.5	0.229
		C ₃₂ Novelty		
		C ₃₃ Richness and comprehensiveness		
C ₄ Security	0.097	C ₄₁ Account information	0.25	0.115
		C ₄₂ System safety	0.458	0.058
		C ₄₃ Running speed	0.352	0.045

3 COMPREHENSIVE EVALUATION MODEL OF NETWORK COMMUNITY INFORMATION QUALITY

Let t be the set of evaluation factors, $T = \{T_1, T_2, \dots, T_n\}$, T_i represents the first level index of the website, T_i contains several sub factors, $T_i = \{T_{i1}, T_{i2}, \dots, T_{im}\}$, T_{ij} represents the secondary index in the evaluation index system. V represents the evaluation result set, $V = \{V_1, V_2, V_3, V_4, V_5\}$, respectively, indicating excellent, good, medium, qualified and unqualified; W stands for weight, $W = \{W_1, W_2, \dots, W_n\}$, where $W_i = \{W_{i1}, W_{i2}, \dots, W_{im}\}$, W_i is the

weight of the first level index, W_{ij} refers to the weight of secondary indicators.

Taking a community website as an example, the questionnaire is filled in. Each index item is set with a questionnaire question, and the answers are expressed by "excellent", "good", "medium", "qualified" and "unqualified". The basic steps of fuzzy comprehensive evaluation are as follows.^[7]

(1) Calculate the website single factor evaluation, $r_{ij} = \frac{\sum_{k=1}^n x_{ij}^{(k)}}{n}$, where $x_{ij}^{(k)}$ indicates that the k th user evaluates the i th factor as V_j 's membership degree. r_{ij} is evaluated as the average comprehensive membership degree of V_j .

(2) Single factor evaluation matrix R_i :

$$R_i = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \dots & \dots & \dots & \dots \\ r_{n1} & r_{n2} & \dots & r_{nm} \end{bmatrix}$$

(3) Calculate the evaluation vector of single factor set

The evaluation vector S_i of factor set T_i is obtained by combining the single factor evaluation matrix R with its corresponding weight W . That is: $S_i = W_i \circ R_i$

(4) Calculate the comprehensive evaluation results

According to the evaluation result S_i of T_i , the evaluation matrix of factor set T can be obtained. Therefore, the fuzzy comprehensive evaluation results of factor set t are as follows:

$$S^* = W \circ R$$

If the evaluation result set is quantified as an interval, "excellent", "good", "medium", "qualified" and "unqualified" correspond to [100,90], [89,80], [79,70], [69,60], [59,0] respectively. According to the principle of maximum membership, the information quality evaluation results of the community website can be obtained.

4 SUMMARY

Improving information quality is an important part of website construction. This paper constructs the evaluation index of network community information quality, and establishes the evaluation model of specific website. The research content of this paper has a certain supplementary significance to the current website evaluation system, and the research methods used also have certain reference value for related research.

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