Research on Evaluation Model of Social Network Information Management Based on Asymmetric Fuzzy Algorithm

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Abstract. The existing evaluation model of the index system and the weight of each index is not perfect, leading to the final evaluation result is not ideal. Therefore, the evaluation model of social network information management based on asymmetric fuzzy algorithm is established. Based on the theory of analytic hierarchy process (AHP), by comparing two indexes of the same level, the judgment matrix is constructed, and the weights of indexes of different levels are obtained. On this basis, the process of determining the security level of MIS by using fuzzy asymmetric closeness degree is discussed, and the specific steps of system security early warning evaluation are given. The practical application of the evaluation model shows that the social network information management system developed by the enterprise is generally satisfactory, especially in the aspect of performance level index. For the independent business system and special business system put into use in the early stage of the company, the development level and performance level of the integrated social network information management system are satisfactory. On the other hand, the technical performance, system characteristics, operation efficiency and operation use of the system need to be improved.

Keywords: Asymmetric fuzzy algorithm · Social network information management · Evaluation model · Analytic hierarchy process · MIS safety level

1 Introduction

In the Internet age, the social communication mode is broken, and the people begin to accept the communication in the form of words, pictures, videos and so on. This online form of social interaction is becoming more common and is gradually replacing some of the traditional face-to-face social interaction. Social networks allow users to freely generate content, voluntarily share content, and spontaneously distribute content on their platforms. This makes the user's offline social relations in the online can be divergent, transfer and extension. Users' behavior of posting, replying, commenting, forwarding and so on not only enrich the content of social network, but also make the potential influence of social network huge. SNS (Social Networking Services) is a Social network-oriented Internet service established by people according to the six degrees of

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segmentation theory. Generalized says, everything will "relationships" function as the interaction between the core network products can be attributed to under the large concept of SNS, typically including Facebook, renren and kaixin, domestic well-known micro bobby such as sina weibo, in addition to information release, also fully integrated all sorts of social functions, such as chatting, micro group, classification of community, etc., so also belong to the category of social networking applications.

In recent years, with the rapid development of modern social network information system technology, more and more attention has been paid to the use of social network information systems in all walks of life. Compared with the traditional mode of work, social network information system can reduce the working link, speed up the transmission of information, and greatly enhance the storage of data security and confidentiality. At the same time, data and information processing, query, statistics, and analysis will be more convenient. With the improvement of people's daily work efficiency, social network information system is vigorously promoting the development of social productive forces. However, due to the rapid development of social network information systems, the realization of their functions is often the focus of scholars and users' research and application, but the application quality of the system is easy to be ignored. Therefore, although many social network information systems are in operation and use, their actual efficiency is difficult to be satisfactory [1]. In order to adapt to the development situation, enterprises will continue to develop new social network information systems or constantly improve the existing systems, which requires us to conduct a comprehensive evaluation of the social network information system, so as to find out the existing problems of the system, and also to avoid the same problem again in the newly developed system [2].

The evaluation of social network information system is a very large and complex project. First of all, the construction of social network information system is a high-tech field. On the one hand, it has practical significance and is worth studying. On the other hand, the risks associated with it are relatively large. Secondly, the construction of social network information system is a long-term investment, not only visible hardware facilities, soft investment (development, maintenance, training, etc.) in the system construction and operation is bound to account for a large proportion of the total investment, but this part of the cost cannot be clearly reflected. Thirdly, the benefit which the social network information system brings is difficult to manifest in the system movement in short time, which has the lagging characteristic. Fourthly, the enterprise management foundation, the rule Institutions, user's awareness level, knowledge level and other factors have a direct bearing on the size of the role played by social network information systems [3, 4]. The above intertwined factors will affect the quality of social network information systems and the evaluation of project implementation. These factors include political, economic, social, technical and so on. Therefore, enterprise social network information system project evaluation is actually a very complex and comprehensive subject. At present, there is a groping stage in China and abroad in the three major research fields of evaluation basic theory, evaluation index system design and specific evaluation implementation methods.

Reference [5] puts forward and establishes a social network information management evaluation model based on integration perspective. From the perspective of technology-service-business support integration, Delphi method is used to conduct two rounds of expert consultation on 17 experts to establish the evaluation index system of social network information management system construction effect, and AHP is used to determine the index weight. The recovery rates of the two rounds of expert consultation were 94% and 88%, respectively. More than 50% of the 17 experts were enterprise social network information system managers who had worked in related fields for more than 10 years. They were direct users of the social network information system, and their authority was 83%. The final index system consists of 6 first level indicators and 24 two level indicators. The index system reflects the measurement of different levels of the social network information management system, and lays a foundation for the comprehensive analysis of the problems and improvement direction of the social network information management system. Reference [6] puts forward and establishes a social network information management evaluation model based on expectation-satisfaction evaluation. From the perspective of "user view" and based on the method of user expectation-satisfaction evaluation model, it reveals the informatization effect of enterprises at the micro-level by analyzing the correlation between users' expectation effect and actual performance of enterprise social network information system. In reference [7], aiming at the problem of resolution limitation in the new method of network key node identification h-index, based on the consideration of network information propagation probability, a method of social network key node identification based on adjacent h-index is proposed to realize the evaluation of social network information management, This method can accurately measure the real influence level of the nodes to be evaluated. Sir (stochastic infectious recovered) model is used to evaluate the actual communication ability of nodes in real social networks, and the effectiveness of the proposed method is verified. The characteristics of knowledge sharing management in social networks are analyzed theoretically in reference [8], The evaluation of social network information management is completed by visual tools. Firstly, the questionnaire is designed, and the matrix is drawn through the survey results, and then the organizational knowledge sharing and communication chart is drawn by using social network analysis method.

The above-mentioned evaluation model is not comprehensive enough to establish the evaluation index system of MIS and assign the weights of the indicators at all levels, so that the final evaluation results cannot find the existing problems in MIS in time. A social network information management evaluation model based on asymmetric fuzzy algorithm is established in this study. The overall framework of the study is described as follows:

(1) According to the demand of enterprise for MIS and the characteristics of MIS, the evaluation index system of MIS is established on the basis of consulting experts' opinions.
(2) Based on the theory of analytic hierarchy process (AHP), a judgment matrix is constructed by comparing two indexes at the same level, and the weights of indexes at different levels are calculated by combining the mathematical operation of the judgment matrix, then the consistency test is carried out.

(3) On this basis, the fuzzy asymmetric closeness degree is used to determine the security level of MIS, and the concrete calculation steps of system security early warning evaluation are given.
(4) The practical application results of the evaluation model show that the social network information management system developed by an enterprise is generally satisfactory, especially in the aspect of performance level indicators. For the independent and special business systems that have been put into use in the early stage of the company, the development level and performance level of the integrated social network information management system are both satisfactory. On the other hand, the technical performance, system characteristics, operational efficiency and operational use of the system still need to be improved.

The spread speed of social network information is very fast, which makes social network become a bigger influence. The current situation of huge user base and long time investment determines the influence of social network in our country. Therefore, the analysis of social network information management methods and related evaluation is to promote the healthy development of social networks necessary premise. Therefore, this research has established the social network information management appraisal model based on the asymmetric fuzzy algorithm.

2 Research on Social Network Information Management Evaluation Model Based on Asymmetric Fuzzy Algorithm

2.1 Construction of Evaluation Index System for Social Network Information Management

On the basis of consulting and summarizing the existing domestic and foreign literature, combining with the enterprise's demand for social network information management system and the characteristics of enterprise social network information management system itself, and fully consulting experts and scholars' opinions, the evaluation index system of social network information management system is finally obtained. The specific process is as follows:

(1) According to the domestic and foreign references, it summarized the existing social network information management system evaluation index system situation, and listed different evaluation index system one by one;
(2) The existing evaluation index system is comprehensively analyzed, the indicators with the same meaning are summarized, the different indicators are classified, and a comprehensive evaluation index system of social network information management system based on literature is obtained.
(3) According to the demand of the public transportation industry and the enterprise for the social network information management system and the characteristics of the enterprise social network information management system, the index is screened, optimized, recombined and designed, and the preliminary evaluation index system of the enterprise social network information management system is obtained.

(4) The social network information system technical experts, the enterprise social network information management system developers, the managers of the enterprise departments and the university teachers (altogether 8 persons) were invited to put forward their opinions on the preliminary evaluation index system of the enterprise social network information management system.
(5) After collecting the opinions of experts and scholars, the evaluation index system of enterprise social network information management system is optimized.
(6) It consulted experts and scholars again to optimize the evaluation index system of the enterprise social network information management system.

After two consultation and optimization, the enterprise social network information management system evaluation index system was finally obtained. The index system consists of five primary indicators, including technical performance, system characteristics, operational efficiency, performance level and operational use. Each primary index contains several secondary indexes, and there are 20 secondary indexes in the evaluation index system. The specific indicators are as follows:

Technical Performance Index

(1) The degree of realization of goal function, which indicates the degree to which the system achieves the planning objectives proposed in the planning, design and analysis phases.
(2) Progressiveness, which indicates whether the social network information management system integrates the leading scientific management knowledge, and whether the design of the system is scientific and has strong applicability.
(3) Standardity, which indicates whether to set up social network information system platform according to relevant international standards, national standards, industry standards, database standard format and metadata standard format, and whether documents and materials are standardized for archiving.
(4) The quality of software, which includes the operability, scalability and practicability of the system software.

Characteristics of Social Network Information Management System

(1) Functional integrity, which indicates whether the system covers information collection, processing, storage, archiving, organization, utilization and other functions.
(2) Work efficiency, which mainly refers to the efficiency characteristics related to time and speed, including reaction time, operation speed and so on. It can be embodied in the time of opening the system, searching for information, importing and exporting data, implementing various functions, opening various links and so on.
(3) Security and confidentiality, which indicates whether the system software and hardware are reliable, whether it meets the national security requirements for credit user identification, authentication, anti-illegal intrusion, firewall, information management software, system data backup and so on.
(4) Maintainability, maintenance personnel maintenance system difficulty level, it is determined by the system modularization, simplification and standardization and other factors.

(5) Reliability, which indicates the basic guarantee of the system's continuous operation according to the functional requirements, the system can be quickly repaired after failure, while the data can be protected in this case.

Operation Benefit

(1) Direct economic benefits and direct benefits gained from the application of social network information systems. It includes the increase of passenger traffic, the increase of passenger revenue and the increase of government subsidies.
(2) Indirect economic benefits and indirect benefits gained from the application of social network information system. It includes the expansion and optimization of line resources, the improvement of brand value, the promotion of corporate culture, the promotion of corporate image and so on.
(3) Social benefits, which providing better services for the public and scientific utilization of public resources.

Performance Level

(1) The degree of realization of the planning objectives, which indicates the phased slogans of the strategic planning, the overall objectives and the degree of realization of the specific indicators.
(2) Management efficiency, which indicates whether the application of the system brings about the reform and innovation of organizational structure, management mode and business process; it includes the ability of information collection, transmission, processing speed, operation efficiency, responding to user needs, improving the level of decision-making and so on.
(3) Cost savings. It can be measured by saving office expenses, reducing the number of workers, reducing the intensity of work, and optimizing the use of resources.
(4) User satisfaction, which indicates whether the functions, characteristics, services and interfaces of the system meet the diversified and personalized needs of users, whether users are satisfied or not.

Based on the above analysis, we set up an evaluation index system for social network information management, as shown in Table 1.

Table 1. Evaluation index system of social network information management

Evaluation index system	Primary index U_i	Secondary index U_{ij}
Social network information management evaluation index system (U)	Technical performance (U_1)	Target function implementation (U_{11})
		Progressiveness (U_{121})
		Standardization (U_{13})
		Software quality (U_{14})
	System characteristics (U_2)	Functional integrity (U_{21})
		Work efficiency (U_{22})
		Security and confidentiality (U_{23})
		Maintainability (U_{24})
		Reliability (U_{25})
	Operation benefit (U_3)	Direct economic benefits (U_{31})
		Indirect economic benefits (U_{32})
		Social results (U_{33})
	Performance level (U_4)	Planning target realization degree (U_{41})
		Management efficiency (U_{42})
		Cost savings (U_{43})
		User satisfaction (U_{44})
	Operation and use (U_5)	Input standardization (U_{51})
		Output standardization (U_{52})
		Operation safety (U_{53})
		Friendly and convenient interface (U_{54})

2.2 Determining the Weight of Risk Indicators

In the index system, the importance of each index to the target is different, when measuring the contribution of each index to the target, different weights should be given, the important person should be given greater weight. Index weight is a quantitative way to reflect the proportion of various indicators in the comprehensive evaluation. Whether the weight is determined scientifically and rationally will directly affect the accuracy of evaluation, which is an important factor in the evaluation process. The weight can

be determined individually, but in order to make the result more authoritative and reasonable, the expert investigation method is adopted, and the AHP method is used to determine the weight on the basis of the experts' scoring according to China's national conditions.

(1) The General Procedure of AHP (AHP) is as Follows:

First, determine the evaluation problem. The analytic hierarchy process (AHP) is used to define the objectives and problems to be evaluated in order to clarify the purpose of decision-making.

Second, list the elements of evaluation. In view of the problem to be evaluated, it collects the opinions of experts and scholars, and the elements to be evaluated will be listed one by one.

Third, establish a hierarchical structure model. After in-depth analysis of the problems faced, the factors included in the problem are divided into different levels (such as target level, criterion level, index level, scheme level, measure level, etc.). Then the hierarchical structure of the hierarchy and the subordinate relationship of the factors are illustrated in the form of block diagram. When there are many factors in a certain level, the level can be further divided into several sub-levels, the index system has three levels: the highest level (target W), the intermediate level (primary evaluation index U_i, $i = 1$, 2, 3, 4, 5) and the lowest level (secondary evaluation index U_{ij}, $i = 1, 2, 3, 4, j = 1, \cdots, 6$).

Fourth, use the 22 comparison method to construct judgment matrix. The judgment matrix represents the comparison of the relative importance of the factors at the upper level. The values of the elements of the judgment matrix reflect people's understanding of the relative importance of the factors. Generally, the scaling method of the number 1–9 and its reciprocal is adopted (as shown in Table 2). When the importance of the comparative factors can be explained by a meaningful ratio, the value of the judgment matrix can take this ratio.

Table 2. Scale values of relative importance of indicators

Scale	Extremely important	Very important	Important	A little more important	Equally important	A little less important	Unimportance	Very unimportant	Extremely unimportant
b_{ij}	9	7	5	3	1	1/3	1/5	1/7	1/9

Fifth, calculate the weight of each judgment matrix and make consistency test.

Calculate the product of every row element in the judgment matrix M_i

$$M_i = \prod_{j=1}^{n} b_{ij},\ i = 1, 2, \cdots, n \tag{1}$$

The n square root $\overline{W}_i n$ of M_i can be obtained as follows:

$$\overline{W}_i = \sqrt[n]{M_i} \tag{2}$$

Normalized vector $\overline{W} = (\overline{W}_1, \overline{W}_2, L, \overline{W}_n)^T$ can be obtained:

$$W_i = \frac{\overline{W}_i}{\sum_{j=1}^{n} \overline{W}_i} \tag{3}$$

Then $W = (W_1, W_2, \cdots, W_n)^T$ is the eigenvector.

The largest eigenvalue $\lambda_{\max}$ of the judgment matrix is calculated.

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(BW)_i}{nW_i} i \tag{4}$$

Among them, $(BW)_i$ represents the i element of vector BW, and its formula is as follows:

$$BW = \begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ b_{n1} & b_{n2} & \cdots & b_{nn} \end{bmatrix} \begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ W_n \end{bmatrix} = \begin{bmatrix} (BW)_1 \\ (BW)_2 \\ \vdots \\ (BW)_n \end{bmatrix} \tag{5}$$

Consistency Check:

When the consistency check coefficient CR of the judgment matrix satisfies the following formula (6), the judgment matrix can be considered to have satisfactory consistency; otherwise the element values of the matrix must be adjusted [9, 10].

$$CR = \frac{CI}{RI} < 0.01 \tag{6}$$

$$CI = \frac{\lambda_{\max} - n}{n - 1} \tag{7}$$

Among them, RI represents the average random consistency index; CI represents the consistency index.

For the 1–9 judgment matrix, the value of RI is shown in Table 3.

Table 3. *RI* value

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Finally, the weight set of the first level evaluation index of social network information management is $W = (W_1, W_2, W_3, W_4)$, $W \geq 0$, $\sum_{i=1}^{5} W_i = 1$. The weight set of the secondary evaluation index is $W_i = (W_{i1}, W_{i2}, \cdots, W_{ij})$ U_{ij}, $W_i \geq 0$, $\sum_{j=1}^{n} W_{ij} = 1$.

Analytic Hierarchy Process (AHP) synthesizes the advantages of a certain aspect of venture capitalists' personal experience and quantitative analysis tools. The data of AHP comes from the judgment of the venture capitalists and related personnel based on their personal experience. The calculation results also require the venture capitalists to handle flexibly according to specific circumstances. It can be said that the process of determining the weight of indicators by AHP is the unification of science and art.

(2) Determining Membership Degree Matrix

The percentage statistics method is used in the study. The method is to count the percentage of the evaluation results of the evaluation objects directly, and take the results as the membership degree of the index. The method of determining membership is as follows [11]:

There are m elements in the evaluation factor domain and 5 grades in the evaluation level domain. The evaluation result is r_{ij} ($i = 1, 2, \cdots, m,\ j = 1, 2, \cdots, nk$) and H is the expert to participate in the social network information management evaluation. For the evaluation result $u_{i1}^k, u_{i2}^k, \cdots, u_{in}^k k$ ($k = 1, 2, \cdots, H$) of the expert k to the evaluation object i, one component of the result is 1 and the other component is 0, as shown in Table 4. Only one of each element in the Chinese comment element is 1, and the rest is 0. The determination of membership matrix is obtained from the following calculation.

$$r_{ij} = \sum_{k=1}^{H} u_{ij}^k \tag{8}$$

Table 4. Evaluation results of qualitative indicators given by an expert

Grade evaluation object	1	2	3	…	m
1	0	0	1	0	0
2	1	0	0	0	0
3	0	0	1	0	0
…	0	0	0	0	1
m	0	1	0	0	0

The judgment matrix constituted by r_{ij} is:

$$R = \begin{vmatrix} r_{11} & r_{12} & r_{13} & \cdots & r_{1n} \\ r_{21} & r_{22} & r_{23} & \cdots & r_{2n} \\ r_{31} & r_{32} & r_{33} & \cdots & r_{3n} \\ \vdots & \vdots & \vdots & \cdots & \vdots \\ r_{m1} & r_{m2} & r_{m3} & \cdots & r_{mn} \end{vmatrix} \tag{9}$$

(3) Using Fuzzy Symmetric Closeness Degree to Carry Out Comprehensive Evaluation to Determine the Evaluation Set

In order to effectively carry out the fuzzy comprehensive measurement and prevent the loss of effective information, the weighted average operator can be used to replace the traditional large and small operators [12, 13]. Set the fuzzy comprehensive evaluation set as B, that is:

$$B = W \circ R = (b_{j'}),\ j' = 1, 2, 3 \cdots, c \tag{10}$$

$$b_{j'} = \sum_{i=1}^{m} W_i u_{ij} \tag{11}$$

Among them, u_{ij} indicates the membership of evaluation index. Each element in B can be obtained according to fuzzy operation rules.

Definition of Asymmetric Closeness Degree
Closeness is a measure of the degree of approximation of two fuzzy subsets, which is divided into symmetric and asymmetric degree of approximation. Previous studies have proved that the degree of asymmetry evaluation is effective. The definition of asymmetric degree of closeness is:

$$N(A, B) = 1 - \frac{1}{n} \sum_{k=1}^{n} \left| u_A^{\frac{1}{p}}(u_k) - u_B^{\frac{1}{p}}(u_k) \right|^k \tag{12}$$

If $b_{i'} = \max\limits_{1 \le j' \le c} (b_{j'})$ is satisfied, $D_i = (0, \cdots, 0, 1, 0, \cdots, 0) = (d_1, \cdots, d_{i-1}, 1, d_{i+1}, \cdots, d_c)$ is called the characteristic fuzzy subset of component $V = \{v_1, v_2, \cdots, v_c\}$ in the fuzzy universe $v_{i'}$ of social network information management evaluation level.

Fuzzy Comprehensive Evaluation Algorithm Based on Asymmetric Closeness Degree
Step 1: standardize B

Vector $b_i (i \in i_c = \{1, 2, \cdots c\})$ is ranked last, for any $i_1, i_2 \in I_c = \{1, 2, \cdots, c\}$, for any $i_1, i_2 \in I_c$, if $|i_1 - i| > |i_2 - i|$, b_{i1} is placed before b_{i2}; if $|i_1 - i| = |i_2 - i|$, and $i_1 > i_2$, b_{i1} is placed behind b_{i2}, the standardized B is recorded as:

$$B^{(1)} = (b_1^i, b_2^i, \cdots, b_c^i) = (b_{i+2}, b_{i-2}, b_{i+1}, b_{i-1}, b_i) \tag{13}$$

Accordingly, standardization of D_i can be obtained:

$$D_c = (d_1^c, d_2^c, \cdots, d_{n-1}^c, d_n^c) \tag{14}$$

Step 2: calculate the degree of asymmetric closeness:

$$N(B, D_i) = N(B^{(1)}, D_c),\ i \in I_c \tag{15}$$

$$N(B^{(1)}, D_c) = 1 - \frac{1}{c} \sum_{r=1}^{c} \left| (b_r^i)^p - (d_r^c)^p \right|^r \tag{16}$$

Among them, r is a constant; p means probability.

Step 3: if the following conditions are met:

$$N(B, D_k) = \max_{1 \le j \le c} N(B, D_i) \tag{17}$$

It indicates that the evaluation results of social network information management system belong to grade $v_{i'}$.

3 Analysis on Implementation Effect of Social Network Information Management Evaluation of an Enterprise

3.1 Evaluation Process

(1) Quantitative Evaluation

In the evaluation system constructed in the study, quantitative evaluation refers to the information collected through various ways, the design of the index system in the evaluation object through the above series of operations, get a specific quantitative value according to the evaluation model, the value is the result of quantitative evaluation. Therefore, quantitative evaluation reflects the direct evaluation results of the evaluation objects through the index system, and it is also the most important process in the evaluation of the whole social network information system.

In the process of quantitative evaluation, considering the authoritativeness, authenticity, objectivity and scientificity of the evaluation, and considering the characteristics of the enterprise to be evaluated and the characteristics of the social network information management system itself, the evaluation data of the design evaluation model comes from three types of personnel: users of the social network information system, company leaders and information technology experts. At the same time, the evaluation value of these three types of personnel is given a certain proportion of weight, and the final evaluation result of the system is decided by them. The actual users of the system are the users of the social network information system. Their experience is the most authentic and direct. Their evaluation results are also the most credible and objective. The real situation in the process of using the system can be reflected by their evaluation. Therefore, the user rating of the social network information system in this evaluation model is set up. The weight of the value in the overall system score is 60%; compared with the social network information system users, the company leaders use the system less frequently, and they generally only care about some important functions and indicators, but at the same time, the system development experience can also give professional evaluation of the system, and easier to find the system exists.

Quantitative evaluation is divided into four steps: social network information system user rating, corporate leadership rating, information technology expert rating and data aggregation, in which social network information system user rating, corporate leadership rating and information technology expert rating can be synchronized. The final score of users, leaders and experts in each evaluation index is the average score of all users, leaders and experts under the index. The evaluation table of enterprise social network information management system is designed, which is scored by social network information system users, company leaders and information technology experts.

In the analysis of evaluation questionnaires, the corresponding scoring criteria and criteria should be worked out according to the different grades of each evaluation. These criteria can control the objective evaluation, reduce the subjective factors of the evaluators, and also provide convenience for the data processors, so that the quantitative analysis can be based on. Five qualitative ratings (excellent, good, general, poor, very poor) are assigned to each of them, as shown in Table 5.

Table 5. The corresponding table of qualitative evaluation grades and scores

Evaluation grade	Excellent	Good	General	Poor	Very poor
Corresponding score	100	80	70	60	50

Note: 1) Score of each secondary indicator = User score * User score weight + Leader score * Leader score weight + Information Technology Expert score * Expert score weight.
2) The score of each primary index = $\sum$(the score of each secondary index under the primary index * the corresponding weight of each secondary index under the primary index).
3) The total score of the system = $\sum$ (index of each level * index weight of each level).

(2) Qualitative Evaluation

Quantitative evaluation results obtained from the quantitative evaluation step should be between 50 and 100 points, and a quantitative fractional section should be designed to correspond to the qualitative evaluation criteria, so as to qualitatively judge the construction and operation of the system.

Since the corresponding scores of each quantitative evaluation grade are excellent (100 points), good (80 points), general (70 points), poor (60 points), very poor (50 points) and so on, the corresponding criteria of quantitative evaluation results and qualitative evaluation are obtained, as shown in Table 6.

Table 6. Relationship between quantitative evaluation results and qualitative evaluation

Qualitative evaluation grade	Quantitative evaluation score
Excellent	$85 \leq$ System quantitative evaluation total score ≤ 100
Good	$75 \leq$ System quantitative evaluation total score < 85
General	$65 \leq$ System quantitative evaluation total score < 75
Poor	$55 \leq$ System quantitative evaluation total score < 65
Very poor	System quantitative evaluation total score < 55

(3) Feedback from Evaluation Results

The last link of the evaluation implementation process is the feedback of evaluation results, which is the direct expression of the evaluation results of social network information systems. It mainly reflects the evaluation methods, basis, indicators, standards, means and the final evaluation level, etc. According to the final evaluation situation, the improvement suggestions for social network information systems are given.

3.2 Evaluation and Implementation

(1) Data Collection

Questionnaire design and questionnaire release. The third party is responsible for the issuance of the questionnaire. The social network information system users and enterprise leaders are sent to them by the third party within the enterprise. The information technology experts are invited by the third party to conduct the survey outside the enterprise. At the same time, the third party will guide the evaluators to fill in the relevant questionnaires, including the specific meaning of the relevant questions in the questionnaire, scoring criteria, filling criteria and so on. The problems encountered by the evaluators in the scoring process will be explained one by one by the third party, so as to ensure the quality of the questionnaire.

(2) Data Processing

A total of 120 questionnaires were sent out in this survey. Among them, 48 users of the social network information system, 7 leaders of the company and 5 experts of information technology were given questionnaires. According to statistics, 60 questionnaires were collected, 120 of which were valid and the effective recovery rate was 100%.

Processing the data of the collected questionnaires, the comprehensive total score of each secondary index of the evaluation system of enterprise social network information management system to be evaluated is obtained, as shown in Table 7.

(3) Model Calculation

Table 7. Comprehensive evaluation of the secondary indicators of the enterprise social network information management evaluation system

Evaluation index system	Primary index	Secondary index	User score (60%)	Leader score (25%)	Expert score (15%)	Total score (100%)
Social network information management evaluation index system (U)	Technical performance	Target function implementation (U_{11})	78	88	86	85
		Progressiveness (U_{121})	74	84	81	81
		Standardization (U_{13})	77	94	81	86

(*continued*)

Table 7. (*continued*)

Evaluation index system	Primary index	Secondary index	User score (60%)	Leader score (25%)	Expert score (15%)	Total score (100%)
		Software quality (U_{14})	73	84	76	80
	System characteristics (U_2)	Functional integrity (U_{21})	75	84	71	80
		Work efficiency (U_{22})	80	88	86	87
		Security and confidentiality (U_{23})	76	88	76	83
		Maintainability (U_{24})	80	88	86	87
		Reliability (U_{25})	79	94	81	87

According to the weight value of each index in the evaluation index system of enterprise social network information management system, the overall score of each index and the evaluation index system is obtained, as shown in Table 8.

Table 8. Total score of the enterprise social network information management evaluation index system

Evaluating indicator	Score	Primary index	Weight value	Score	Secondary index	Weight value	Score
Social network information management evaluation index system (U)	84	Technical performance (U_1)	0.11	83	Target function implementation (U_{11})	0.28	85
					Progressiveness (U_{121})	0.51	81
					Standardization (U_{13})	0.10	86
					Software quality (U_{14})	0.15	80
		System characteristics (U_2)	0.29	84	Functional integrity (U_{21})	0.49	80
					Work efficiency (U_{22})	0.29	87
					Security and confidentiality (U_{23})	0.07	83
					Maintainability (U_{24})	0.11	87

(*continued*)

Table 8. (*continued*)

Evaluating indicator	Score	Primary index	Weight value	Score	Secondary index	Weight value	Score
					Reliability (U_{25})	0.09	87

(4) Evaluation Results

According to the corresponding relationship between quantitative evaluation results and qualitative evaluation, the technical performance index score is 83 and the evaluation grade is "good"; the system characteristic index score is 84 and the evaluation grade is "good"; the operation benefit index score is 80 and the evaluation grade is "good"; the effective level index score is 87, which evaluation grade is "excellent"; operational use index score is 82, which evaluation grade is "good"; system total score is 84, which evaluation rating grade is "good".

(5) Analysis and Suggestion of Evaluation Results

Through this evaluation, the social network information management system developed by the enterprise is evaluated quantitatively and qualitatively.

Through this evaluation, we can see that the social network information management system developed by the enterprise has reached a good level on the whole, especially in the performance level indicators, reached the "excellent" level, for the company has been put into use earlier, independent, special business systems, the performance level have been greatly improved.

However, through the evaluation results, it can be seen that the system can only achieve "good" level in technical performance, system characteristics, operational efficiency and operational use, indicating that there are still some shortcomings in the above aspects. The details are as follows:

(1) In terms of technical performance, the enterprise social network information management system is developed entirely by the technical team of the company. The advantage of this is that the developers are familiar with the company and the developed system is closer to the actual situation of the company. On the other hand, the technical level of the technical team inside the company is still higher than that of the professional developers outside the company. There is a certain gap, resulting in some shortcomings in the technical performance of the system, especially in the advanced and software quality. Therefore, it is suggested that the enterprise should introduce external technical team in the process of system follow-up improvement and maintenance, and let the external professional team give guidance from the technical level, so as to continuously improve the technical performance of the system.

(2) In the aspect of system characteristics, the reliability of data is not guaranteed to a certain extent due to the lack of necessary data entry and verification mechanism in the system design; the functional integrity score is low; and the different requirements of different business personnel on system functions also lead to the absence of special security management in the system social network information system. Institutions,

security management system, input verification mechanism, to a certain extent, also affect the safety score. To this end, it is proposed to develop enterprise social network information management system safety management system or set up system safety management posts, standardize the use and management of the system.

(3) In terms of operational efficiency, MIS improves work efficiency and reduces costs, which will inevitably bring direct and indirect economic benefits to enterprises. However, the economic benefits of MIS are lagging behind. In the short term, the benefits may not be obvious, but in the long run, it will bring great economic and social benefits to enterprises.

(4) Operational use, as the enterprise belongs to the traditional public transport enterprises, most of the managers of the traditional public transport enterprises are promoted from front-line drivers, stationmasters and technical workers, the level of computer operation is not high, therefore, more attention should be paid to the social network information management system development such as easy to operate, simple and other aspects. Therefore, it is suggested to further simplify and unify the system interface so as to make the interface display clearer and the information can be obtained more easily and quickly. At the same time, some auxiliary and prompting functions, such as help prompt, step prompt and so on, can be added to the system interface to reduce the difficulty of system operation and improve the work efficiency.

4 Conclusions

Under the background of information age, MIS has become an indispensable part of the development of enterprises. The advantages and disadvantages of MIS, to a certain extent, determine the competitiveness of enterprises. Therefore, it is very important to evaluate the social network information management system for the level of enterprise information and the development of enterprises. According to the requirement of enterprise to MIS and the characteristics of MIS, the evaluation index system of MIS is established on the basis of consulting experts' opinions. Based on the theory of analytic hierarchy process (AHP), a judgment matrix is constructed by comparing two indexes of the same level. Combined with the mathematical operation of the judgment matrix, the weights of indexes at different levels are calculated, and the consistency test is carried out. On this basis, the fuzzy asymmetric closeness degree is used to determine the tube. The process of safety classification of social network information system is discussed, and the specific steps of system safety early warning evaluation are given. Through the above theoretical analysis and practical research, the enterprise has a clearer understanding of the success and shortcomings of the development and application of the social network information management system. For the enterprise's information construction, this study is not only a summary of experience, but also a perfect and improved process for the enterprise's future information development.

The evaluation of enterprise social network information management system is a difficult but highly practical research. However, due to the limitations of research time, the quantity and scope of literature reading and the level of research ability, there are still some shortcomings.

(1) With the development and application of the system, the emphasis of evaluation in different periods will be different, and the evaluation index system needs to be improved and verified to meet the evaluation objectives in different periods.
(2) It is subjective to assign the weights of evaluation indicators and evaluate the system by the evaluators, which may lead to some deviations in the evaluation results. The next step is to have professional quality and level of the evaluators, and to adhere to an objective, conscientious and responsible attitude in order to make more effective evaluation of enterprise social network information management system.

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