Research Article

Performance Evaluation of Online Recruitment Enterprises Based on Intuitionistic Fuzzy Set and TOPSIS

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Received 18 March 2022; Accepted 29 April 2022; Published 18 May 2022

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With the advancement of global informatization process, the development of online recruitment enterprises shows a continuous growth trend. Moreover, the growth rate has long been higher than the average level of the information industry. The adjustment and improvement of industrial structure has become an important means for the sustainable development of online recruitment enterprises. In order to further improve the development level of enterprise online recruitment performance, this paper proposes an improved intuitionistic fuzzy analytic hierarchy process and further proposes an intuitionistic fuzzy TOPSIS method optimized by adaptive ant colony algorithm. Select the sample system and finally determine the index system. Finally, the performance of the improved intuitionistic fuzzy set and TOPSIS method is evaluated. The results show that the improved intuitionistic fuzzy set based on adaptive ant colony algorithm and TOPSIS method proposed in this paper is obviously superior to other methods in optimization ability, stability, convergence speed, and running time and can be better applied to practical work. The improvement of the average performance level of online recruitment enterprises in 2022 mainly depends on the improvement of recruitment and appointment level. Enterprises also need to strengthen recruitment and appointment and optimize the company’s performance management as a whole.

1. Introduction

At present, global competition is becoming fiercer and fiercer, and all industries must find their own competitive advantages [1]. Competitors are also imitating each other’s various new and traditional resources, but enterprise human resources can be easily imitated by competitors, including enterprise employee relations and employees’ knowledge and skills. Therefore, human resources competition between enterprises has become a key link in the competition between enterprises [2]. For online recruitment enterprises, in order to maintain their competitive advantage, they need to do their own human resource management to improve the comprehensive performance of the enterprise, which has also become the focus of enterprise managers and scholars in related fields [3]. Nowadays, with the increasing improvement of social science and technology level, human resources play an increasingly important role in improving enterprise performance. It has become a strategic resource of enterprises and can obtain more competitive advantages [4]. Therefore, the relationship between business performance and human resource management has also attracted the attention of scholars at home and abroad. China’s information industry has gradually developed into an economic pillar industry, which has a great impact on the development of economy [5]. Moreover, the growth rate has been above the average level of the information industry for a long time. The development of online recruitment enterprises shows a continuous growth trend, and the growth rate has been above the average level of the industry for a long time. The adjustment and improvement of industrial structure has become an important means for the sustainable development of online recruitment enterprises. This study will explore the problem of enterprise performance evaluation in the future.

TOPSIS method is a sort of method that can solve the problem of multiobjective attribute and is close to the ideal
solution. TOPSIS method defines the optimal solution of each attribute value in all alternatives as positive ideal solution, and the negative ideal solution is just opposite to the positive ideal solution. The central idea of TOPSIS method is that the selected optimal scheme is infinitely close to the positive ideal scheme and infinitely away from the negative ideal scheme; TOPSIS method is simple and practical and can judge the advantages and disadvantages of alternative schemes.

In this paper, the intuitionistic fuzzy set method is integrated into the analytic hierarchy process, and an optimized intuitionistic fuzzy analytic hierarchy process is proposed. The intuitionistic fuzzy TOPSIS method is creatively applied to the performance evaluation of online recruitment enterprises. Combined with TOPSIS method and adaptive ant colony algorithm, an improved perceptual fuzzy TOPSIS method is proposed and applied to the performance evaluation of online recruitment enterprises. This paper provides a reference for enterprise managers to select the optimal scheme objectives. Compared with the previous research methods, the improved intuitionistic fuzzy set based on adaptive ant colony algorithm and TOPSIS method proposed in this paper improves the optimization ability, stability, convergence speed, and running time of intuitionistic fuzzy set. These aspects are obviously superior to other methods, so that they can be better applied to practical work.

The research content mainly includes four parts. The second part summarizes the research status of intuitionistic fuzzy sets and TOPSIS methods at home and abroad. The third part mainly constructs the performance evaluation system. The first section expounds the improved intuitionistic fuzzy analytic hierarchy process, and the second section puts forward the improved intuitionistic fuzzy TOPSIS method. The third part is the selection and determination of financial samples. The fourth part verifies the performance of TOPSIS method based on improved intuitionistic fuzzy set. The results show that the improved intuitionistic fuzzy set and TOPSIS method have good application effect.

2. Related Work

In recent years, the research of intuitionistic fuzzy set and TOPSIS method has been highly valued by many relevant professionals, and researchers have also conducted in-depth research on this technology. This method studies the extension of intuitionistic fuzzy sets. The results show that this method is very suitable for the prioritization of production management strategies in manufacturing enterprises [6]. Garg and Kaur proposed a new planning model, which can solve decision-making problems in different environments. Similar to the arranged technology, the research has verified its effectiveness and rationality [7]. Gupta et al. proposed a TOPSIS method based on intuitionistic fuzzy set to show why reliability is one of the best parameters to control software quality, sort out the personal opinions of decision makers, and manage software developers of different companies to evaluate the importance of various standards and alternative schemes [8]. Abdullah et al. studied the standards and alternatives in flood management. Using IVIF TOPSIS, the best alternatives in flood mitigation methods can be determined. Four flood management decision makers were invited to evaluate the seven alternatives on the seven standards. The results show that the "pump station" scheme is the best scheme for flood control works, and the results will help the authorities to put forward effective methods of flood control measures [9]. Baccour improved the multi-criteria decision-making of fuzzy sets and proposed a new criterion for similarity decision-making. Finally, an example using TOPSIS and VIKOR is given, and the results of the new similarity and distance measures are compared with some measures in the literature [10].

According to Yang et al., a hybrid intuitionistic fuzzy set combining functional and topological properties is constructed to realize the organic integration of various attribute values. An intuitionistic fuzzy TOPSIS method is proposed to calculate the component closeness and realize the effective ranking of attribute values. The results show that the proposed method is verified by taking the aircraft right landing gear as the research object, and the superiority of this method is confirmed [11]. Based on Liu et al., an intuitionistic fuzzy cluster decision-making model integrating TOPSIS, correlation coefficient, and variable weight is proposed. Through this model, a variety of solutions are evaluated to find the optimal solution. Finally, the feasibility of the proposed model is verified by comparing with a variety of algorithm models [12]. According to Bu et al., the grey correlation method is integrated into TOPSIS, the interval intuitionistic fuzzy number in the model is described by attribute value, and the attribute entropy weight is determined by interval intuitionistic fuzzy entropy. The results show that the proposed model has excellent sensitivity in case analysis [13]. Rouyendeh et al. solved the problems in GSS through the ranking method (TOPSIS), similar to the ideal solution. Since language standards cannot measure all standards, fuzzy method is combined with TOPSIS method to reduce the impact of ambiguity and instability. The results show that the hybrid method of intuitionistic fuzzy set and TOPSIS can be very effective in selecting more suitable suppliers in the alternatives [14]. Wade et al. proposed a ranking preference technique called TOPSIS to determine the importance ranking of some subfactors of causal factors of political stability and introduced the application of intuitionistic fuzzy sets in analysis [15].

3. Construction of Performance Evaluation System Based on Intuitionistic Fuzzy Set and TOPSIS

3.1. Improved Intuitionistic Fuzzy Analytic Hierarchy Process

Intuitionistic fuzzy analytic hierarchy process is an evaluation method by combining intuitionistic fuzzy number analytic hierarchy process. It applies the idea of intuitionistic fuzzy centralized membership degree, nonmembership degree, and hesitation degree to fuzzy analytic hierarchy
Equation (1) satisfies $0 \leq \mu_A + \nu_A \leq 1$ and $x \in X$. Among intuitionistic fuzzy sets, the uncertainty or hesitation of $x$ belonging to $A$ is expressed as $\mu_A (x) = 1 - \mu_A (x) - \nu_A (x)$. If there is an intuitionistic fuzzy number $a_1, a_2$ on the final field, where $a_1 = (\mu_1, \nu_1), \mu_1 \in [0, 1], \nu_1 \in [0, 1], \text{and } \mu_1 + \nu_1 \in [0, 1]; a_2 = (\mu_2, \nu_2), \mu_2 \in [0, 1], \nu_2 \in [0, 1], \text{and } \mu_2 + \nu_2 \in [0, 1].$ If there is a real number $\lambda \geq 0$, the specific algorithm of intuitionistic fuzzy set is shown in

$$a_1 + a_2 = (\mu_1 + \mu_2 - \mu_1 \mu_2, \nu_1 + \nu_2 - \nu_1 \nu_2);$$

$$a_1 a_2 = (\mu_1 \mu_2, \nu_1 + \nu_2 - \nu_1 \nu_2);$$

$$\lambda a_1 = (1 - (1 - \mu_1^\lambda)^\mu_1, (1 - \nu_1^\lambda)^\nu_1);$$

$$\bar{a}_1 = (\nu_1, \mu_1).$$

The weight is further compared, and the new score function is shown in

$$H (a) = \frac{1 - \nu}{1 - \pi} H (a) \in [0, 1].$$

Then calculate the weighted average operator. If there is intuitionistic fuzzy function $a_j = (\mu_j, \nu_j), (j = 1, 2, 3, \ldots, n)$, $\text{Wa}: R^n \rightarrow R; \text{if } W A_w (a_1, a_2, \ldots, a_n) = \sum_{j=1}^{n} \omega_j a_j$, where the real number set is $R$, and $\omega$ represents the weight value of data group $a_j$. Therefore, the algorithm of intuitionistic fuzzy number is shown in

$$W A_w (a_1, a_2, \ldots, a_n) = \sum_{j=1}^{n} \omega_j a_j$$

Combining the above methods with the analytic hierarchy process structure model, the complementary judgment matrix is established, and the importance of each attribute is compared to obtain the intuitive fuzzy judgment matrix:

$$A_m = \left( a_{ij}, a_{ij} = (\mu_{ij}, \nu_{ij}) \right), (i, j = 1, 2, \ldots, m).$$

If the following conditions exist in $A$, then it can be determined as complementary judgment matrix.

$$\mu_{ij} = 0.5, i = 1, 2, \ldots, n;$$

$$a_{ij} = (u_{ij}, v_{ij}), a_{ij} = a_{ij} = (u_{ij}, \mu_{ij}), (i, j = 1, 2, \ldots, m).$$

Suppose expert $P$ obtains $A^{(p)}$ through the relative importance of attributes $i$ and $j$; then the formula for calculating the weight is shown in the following formula:

$$\left( \omega^p \right)^T = \left[ \omega_1^{(p)}, \omega_2^{(p)}, \ldots, \omega_n^{(p)} \right].$$

The intuitionistic fuzzy weighting result can be calculated through (4), as shown in

$$\lambda^T = (\lambda_1, \lambda_2, \ldots, \lambda_n) = \left[ \sum_{p=1}^{k} \omega_p \omega_1^{(p)}, \sum_{p=1}^{k} \omega_p \omega_2^{(p)}, \ldots, \sum_{p=1}^{k} \omega_p \omega_n^{(p)} \right].$$

In (8), $\lambda_i = (\mu_i, \nu_i), i = 1, 2, \ldots, n$. The calculation of primary indicators is shown in the following formula:

$$H (\lambda_i) = \frac{1 - \nu_i}{1 + \pi_i}, i = 1, 2, \ldots, n,$$

$$\sigma_i = \frac{H (\lambda_i)}{\sum_{i=1}^{n} H (\lambda_i)} i = 1, 2, \ldots, n.$$

The intuitionistic fuzzy judgment matrix of the secondary index relative to the primary index is shown in

$$B_r^{(p)} = \left( b_{ij}^{(p)}, b_{ij}^{(p)} = (\mu_{ij}^{(p)}, \nu_{ij}^{(p)}) \right).$$

where the value of $i$ is 1, 2, $m$; the value of $P$ is 1, 2, $k$; the value of $R$ is 1, 2, $n$. XXXX indicates the importance of decision makers relative to secondary indicators.

The value of $i$ and $j$ is 1, 2, $m$; the value of $m$ and $p$ is 1, 2, $k$; the value of $r$ is 1, 2, $n$. $\mu_{ij}^{(p)}, \nu_{ij}^{(p)}$ indicates the importance of decision makers relative to secondary indicators. Then the weighted relative weight $\sigma = (\sigma_{ij})_{p=m}, \sigma_{ij} = (\mu_{ij}^{(p)}, \nu_{ij}^{(p)})$, $p = 1, 2, \ldots, k, i, j = 1, 2, \ldots, m$ of the secondary index relative to the primary index is obtained. The comprehensive weight $\omega^{(2)} = (\omega^{(1)})^T \sigma$ of the secondary index is calculated by comprehensively weighing the primary index weight to the secondary index, as shown in

$$\left( \sigma^{(2)} \right)^T = \left( \sigma_1, \sigma_2, \ldots, \sigma_m \right).$$

Then carry out evaluation calculation. If there are $t$ application schemes and $k$ experts determine the satisfaction degree of $i$ to $j$, then the comprehensive score $H (d_{ij})$ of each scheme can be weighted and compared [16].

3.2. Improved Intuitionistic Fuzzy TOPSIS Method. In order to efficiently solve the problem of multiobjective attributes, this study proposes to use TOPSIS method to optimize the above problems. If there are $m$ schemes $A = \{A_1, A_2, \ldots, A_m\}$, the attribute set $C = \{C_1, C_2, \ldots, C_n\}$ uses $\mu_{ij} \in [0, 1]$ to express the degree that $A_i \in A$ meets $C_j \in C$, and uses $\nu_{ij} \in [0, 1]$ to express the degree that $A_i \in A$ does not meet attribute $C_j \in C$. At the same time, $0 \leq \mu_{ij} + \nu_{ij} \leq 1$; then $A_i$’s evaluation of $C_j$ can be expressed by intuitionistic fuzzy set, i.e., $F_{ij} = (\mu_{ij}, \nu_{ij}, \pi_{ij})$. Considering $A_i$ for $m$ attributes, the attribute value is expressed as
The discrimination effect is good [23]. In Figure 3, the classification accuracy of the improved TOPSIS method is 81.56% and the resolution is 78.47%, indicating that the discrimination effect is good [23].

The mathematical problems in engineering section starts with a formula:

\[
(F_{i1}, F_{i2}, \ldots, F_{im}) = (\langle \mu_{i1}, \nu_{i1}, \pi_{i1} \rangle, \langle \mu_{i2}, \nu_{i2}, \pi_{i2} \rangle, \ldots, \langle \mu_{in}, \nu_{in}, \pi_{in} \rangle),
\]

(12)

\[
P = \begin{bmatrix}
\langle \mu_{i1}, \gamma_{i1}, \pi_{i1} \rangle \\
\langle \mu_{i2}, \gamma_{i2}, \pi_{i2} \rangle \\
\vdots \\
\langle \mu_{in}, \gamma_{in}, \pi_{in} \rangle
\end{bmatrix}
\]

(13)

In (13), 0 ≤ μ_{ij} ≤ 1, 0 ≤ γ_{ij} ≤ 1, 0 ≤ μ_{ij} + γ_{ij} ≤ 1, and π_{ij} = 1 - μ_{ij} - γ_{ij}. For the weight \( \omega_j \) of each attribute, C_{ij} ∈ C. At the same time, 0 ≤ ρ_j + τ_j ≤ 1, δ_j = 1 - ρ_j - τ_j. The weight vector is calculated as follows:

\[
(\omega_1, \omega_2, \ldots, \omega_n) = (\langle \rho_1, \tau_1, \kappa_1 \rangle, \langle \rho_2, \tau_2, \kappa_2 \rangle, \ldots, \langle \rho_n, \tau_n, \kappa_n \rangle).
\]

(14)

Through the intuitionistic fuzzy theory, the weighted normative intuitionistic fuzzy evaluation matrix can be obtained, and the positive and negative ideal solutions of intuitionistic fuzzy are defined as \( A^+ \) and \( A^- \), respectively, as shown in

\[
A^+ = (a_1^+, a_2^+, \ldots, a_n^+),
A^- = (a_1^-, a_2^-, \ldots, a_n^-).
\]

(15)

In (15), \( a_i^+ = (1, 0, 0) \), \( a_i^- = (0, 1, 0) \). Calculate the distance between the positive and negative ideals of \( A_i \), as shown in

\[
d_i^+ = \frac{1}{3n} \sum_{j=1}^{n} \left[ (\mu_{ij} - \mu_j)^2 + (\gamma_{ij} - \gamma_j)^2 + (\pi_{ij} - \pi_j)^2 \right],
\]

\[
d_i^- = \frac{1}{3n} \sum_{j=1}^{n} \left[ (\mu_{ij} - \mu_j)^2 + (\gamma_{ij} - \gamma_j)^2 + (\pi_{ij} - \pi_j)^2 \right].
\]

(16)

Calculate the evaluation index \( k_i \) of each \( A_i \), as shown in (17). Among them, the larger the value of \( k_i \), the better the corresponding scheme.

\[
k_i = \frac{d_i^+}{d_i^+ + d_i^-} \quad (i = 1, 2, \ldots, m).
\]

(17)

This study uses adaptive ant colony algorithm (ACA*) to optimize the model in order to improve the feasibility of the evaluation system. Firstly, the guidance factor is integrated into the probability transfer method to enhance the predictability of the target node and prevent blind selection in the algorithm. If \( I \) is used to represent the distance from node \( i \) to \( E \), see the following formula:

\[
\lambda_{IE} = \frac{m - k \ N_{max} - N \ 1}{d_{IE}}.
\]

(18)

In the above formula, the number of all ant colonies is \( m \), the real-time number of ants is \( k \), the number of real-time iteration cycles is \( N \), and the number of final iteration cycles is expressed as \( N_{max} \). Therefore, the node transition probability is shown in the following formula:

\[
p_{ij}^k(t) = \frac{\tau_{ij}^a \eta_j^p \lambda_{IE}^y(t)}{\sum_{i \in \text{allowed}_k} \tau_{ij}^a \eta_j^p \lambda_{IE}^y(t)}, \quad j \in \text{allowed}_k,
\]

\[
0, \quad \text{otherwise}.
\]

In (19), the heuristic factor is \( \eta_j^p \), and the guiding function is expressed as \( \lambda_{IE}^y(t) \) and \( \lambda_{IE}^x(t) \). The flow is shown in Figure 1.

3.3. Selection of Model Samples and Determination of Index System. This study selects number of online recruitment enterprises with good financial situation as the research object and creates a suitable matching sample through the characteristics of industry and scale. Select some important factors, such as performance management, training and development, salary system, ability training, communication environment, team culture construction, and corporate culture, with a total of 397 key practices [17]. This study mainly evaluates the performance of online recruitment enterprises from five aspects: performance management, salary system, recruitment and appointment, ability training, and the establishment of team culture [18]. Based on the above considerations, on the premise of following the diversification of evaluation perspectives and the rationalization of evaluation models, Delphi method is used to collect opinions from experts and modify the evaluation indexes, and finally the construction of the evaluation index system is completed. There are 5 primary indicators and 29 secondary indicators [19]. The performance index evaluation system of online recruitment enterprises is shown in Table 1.

The improvement is to weigh the relative priority of the secondary indicators according to the primary indicators to obtain the comprehensive weight of the secondary indicators, as shown in Figure 2.

Through the constructed index system, the rationality of the improved intuitionistic fuzzy TOPSIS method proposed in this study is tested, and the prediction results are compared with the GA-SVM algorithm model [20]. The improved intuitionistic fuzzy TOPSIS method mainly measures the distance between the optimal solution and the evaluation object and ranks the worst solution. This method is an effective multiobjective decision analysis method, which compares the prediction results of GA-SVM model [21]. The improved intuitionistic fuzzy TOPSIS method has the same 10 variable principal components as GA-SVM algorithm [22]. The results are shown in Figure 3.

In Figure 3, the classification accuracy of the improved intuitionistic fuzzy TOPSIS method and analytic hierarchy process is 81.56% and the resolution is 78.47%, indicating that the discrimination effect is good [23].
4. Performance Evaluation Based on Improved Intuitionistic Fuzzy Set and TOPSIS Method

Firstly, the model effectiveness of the improved intuitionistic fuzzy set and TOPSIS method (TOPSIS *) based on adaptive ant colony algorithm is evaluated through the verification method of route convergence [24]. The evaluation method is mainly that when there is uncertainty in the network topology, the route will be reconstructed automatically, and the information will be transmitted and relearned until the system is in a stable state and sends a change notice to the routing agent in the network in this process. In the verification process, the convergence performance of TOPSIS * and five algorithms in 8 different scenarios is compared, as shown in Figure 4.

It can be seen from the figure that the convergence of all algorithms occurs after generation 100, of which CNN convergence is the slowest, and the algorithm convergence occurs around generation 100, but SVM and BP began to converge as early as generation 40. The improved intuitionistic fuzzy set and TOPSIS method are still in the process of algorithm optimization when the vast majority algorithms show signs of convergence. Therefore, TOPSIS * can obtain better solutions than other algorithms [16]. At the same time, the more the iterations, the higher the propagation level of TOPSIS * [25].

As can be seen from Figure 5(a), among all the six algorithms, the path optimization of GA algorithm takes the least time, which is close to half of that of TOPSIS * algorithm. However, GA algorithm and TOPSIS * algorithm have the same order of magnitude of data, so the time-consuming gap between the two algorithms may not exceed 2 seconds. Even in the high-performance experimental environment, the time-consuming comparison between the two algorithms will only be smaller and smaller. For the convergence speed, GA is significantly slower than TOPSIS *, and the quality of GA seeking the optimal solution is also significantly lower than TOPSIS *. Therefore, TOPSIS * algorithm has the best performance [16]. Figure 5(b) shows the statistics of standard deviation data of each algorithm after 20 iterations. Among all 6 algorithms, PSO has the largest standard deviation result, and TOPSIS * has the lowest standard deviation in all 8 scenarios, indicating that TOPSIS * has the highest stability.

As can be seen from Figure 6, the box type of TOPSIS * is the narrowest in both scenarios, indicating that the comparison of algorithm results is relatively concentrated. Although TOPSIS * may have some abnormal data in some scenarios, the main reason is that the data of TOPSIS * algorithm in the experiment is relatively concentrated; in practice, the gap between normal and abnormal data of TOPSIS * is very small [26]. Therefore, it can be concluded that TOPSIS * algorithm has better stability.

In this study, 12 online recruitment enterprises are selected as the research object, and in the performance
evaluation system based on intuitionistic fuzzy set and TOPSIS, the comprehensive scores of four first-class indicators of performance management, salary system, recruitment and appointment, and ability training are obtained. The distribution of management performance is steep, and the difference between before and after management is also less than 0. The performance management levels in the establishment years of the enterprise are shown in Figure 7.

With the growth of the establishment years of online recruitment enterprises, the performance management level of enterprises with short establishment years continues to decline, which is mainly affected by the development law of interconnected enterprises and related to the innovation ability of enterprises. Among them, the average level of enterprises within 1~6 years is low, while the average level of enterprises aged 7~9 years is high.
Recruitment, appointment, and ability training also decreased significantly with the increase of establishment years.

Using the improved intuitionistic fuzzy set and TOPSIS method based on adaptive ant colony algorithm proposed in this study, the comprehensive level of performance of 12 online recruitment enterprises is evaluated. The prediction of the enterprise’s performance management, salary system, and recruitment and appointment in 2022 is shown in Figure 8. The average performance level of the enterprise in 2022 mainly depends on the improvement of the recruitment and appointment level. With the development of specialized market, the new job classification is becoming more and more specialized, which also puts forward high requirements for HR keyword search and discrimination ability. Some refined project/business background requirements of enterprise HR are not necessarily supported by the...
Figure 6: Box Plot comparison of various algorithms. (a) Scene 1. (b) Scene 8.

Figure 7: Various performance management levels in the establishment years of the enterprise.

Figure 8: Prediction of the enterprise’s performance management, salary system, and recruitment and appointment in 2022.
traditional talent searcher, which limits the efficiency of resume screening. Research needs to improve recruitment efficiency and optimize recruitment quality, which is a systematic project. In the future, we need to strengthen the work of recruitment and appointment and optimize the performance management of the company as a whole.

5. Conclusion

This research mainly aims at the performance evaluation of online recruitment enterprises, applies the improved intuitionistic fuzzy set and TOPSIS method, and verifies the accuracy of the index system model. An adaptive ant colony algorithm and TOPSIS method are proposed to improve intuitionistic fuzzy sets. With the growth of the establishment years of online recruitment enterprises, the performance management level is declining compared with the enterprises with short establishment years, which is mainly affected by the development law of interconnected enterprises and related to the innovation ability of enterprises. As a whole, the improvement of the average performance level of enterprises in 2022 mainly depends on the improvement of the recruitment and appointment level. Strengthen the recruitment and appointment work and optimize the performance management of the company as a whole. Combined with TOPSIS method and adaptive ant colony algorithm, an improved perceptual fuzzy TOPSIS method is proposed and applied to the performance evaluation of online recruitment enterprises. This paper provides a reference for enterprise managers to choose the optimal scheme goal. Compared with the previous research methods, the improved intuitionistic fuzzy set based on adaptive ant colony algorithm and TOPSIS method proposed in this paper improves the optimization ability, stability, convergence speed, and running time of intuitionistic fuzzy set. Due to the limited time and ability, this study does not carry out the practical application of the model for more online recruitment enterprises. In the follow-up work, the improved intuitionistic fuzzy set based on adaptive ant colony algorithm and TOPSIS method will be applied to the performance evaluation of more online recruitment enterprises, so as to find the deficiencies in the model and optimize it in time.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest or personal relationships that could have appeared to influence the work reported in this paper.

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