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Original Paper

A Study on the Job-Person Matching Model for Counselor Positions in Private Universities Based on the BP Neural Network

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Abstract

With the popularization of higher education, the demand for counselor positions in private universities has been growing steadily. However, current job-person matching products on the market struggle to meet the actual needs of this position. This study focuses on counselor positions in private universities and constructs a job-person matching model based on the BP neural network algorithm, aiming to improve the accuracy and efficiency of counselor recruitment. By collecting and analyzing counselor competency feature data, the BP neural network model was trained and tested, verifying its feasibility and effectiveness. This study provides a scientific basis for counselor recruitment in private universities, helping to optimize the structure of the counselor team and enhance the work efficiency of counselors.

Keywords

BP neural network, private universities, counselor positions, job-person matching model

1. Introduction

In human resource systems, job-person matching occupies an irreplaceable and important position. With the state's great emphasis on higher education, private universities have played a key role in cultivating urgently needed talent, promoting the popularization of higher education, and advancing educational system reform, resulting in a significant increase in their development speed. However, as private universities expand in scale, issues related to job-person matching for counselor positions have

become increasingly prominent. Currently, counselor teams in private universities generally face challenges such as insufficient qualifications, lacking professional competence, and unreasonable job allocation, leading to low work efficiency and adversely affecting the effectiveness of student ideological and political education and daily management. Adhering to the principle of “the right person for the right job”, constructing a scientific job-person matching model has become a core task for enhancing the efficiency of human resource management in private universities.

Traditional job-person matching calculation methods primarily rely on the fuzzy comprehensive evaluation method and the analytic hierarchy process (AHP). While AHP is simple to operate and has strong explanatory power, the subjective weighting assigned by experts is easily influenced by their experience, and the evaluation process is cumbersome. The fuzzy comprehensive evaluation method faces challenges such as difficulties in constructing membership functions and information loss when handling non-linear relationships among multiple indicators. For example, when a private university used the AHP method to match counselor positions, differences in experts' weighting of the “communication skills” indicator led to a 23% deviation between the matching results and actual job performance. Therefore, there is an urgent practical need to develop a model that can objectively, comprehensively, and dynamically assess the degree of job-person matching.

The Back Propagation (BP) neural network, as a computational model simulating the structure of human brain neurons, possesses strong self-learning, self-organizing, and generalization capabilities. It optimizes the objective function through gradient descent, automatically inducts patterns from training data, and adjusts network weights via backpropagation until the output meets error requirements. For example, in a study on the job-person fit of air traffic controllers, the BP neural network model improved matching accuracy by 18% and reduced misjudgment rates by 12% compared to traditional methods. Its intelligence, adaptability, and self-learning capabilities have led to its widespread application in the field of management evaluation.

In recent years, scholars have conducted in-depth research on the job responsibilities, competency characteristics, and career development of counselors in private universities. For example, Yuan Airong et al. proposed applying the person-job matching theory to counselor selection and hiring, constructing an evaluation system using the Holland Occupational Interest Test and the MBTI test; Jiao Hejun et al. achieved precise matching of counselor positions in higher education institutions using a BP neural network, with a matching accuracy rate of 89%. However, existing research has primarily focused on theoretical framework construction or the application of single algorithms, lacking systematic consideration of the unique characteristics of private universities, and has yet to form a complete theoretical framework and operational methods.

This paper proposes a person-position matching model for counselor positions in private universities based on the advantages of the BP neural network. The model constructs a neural network structure with multiple input layers and a single output layer, integrating four-dimensional indicators such as moral qualities, physical and mental qualities, knowledge, and abilities. It trains the network weights

using historical data to achieve dynamic and precise matching between positions and job seekers. This research not only expands the application scenarios of job-person matching theory but also provides a practical tool for optimizing counselor team configuration in private universities. It holds significant practical value for enhancing the quality of ideological and political education for students and promoting the sustainable development of higher education institutions.

2. Research Design

2.1 Research Objectives

This paper aims to construct a position-personnel matching model for counselors at private universities based on a BP neural network, with the goal of improving the efficiency and accuracy of counselor recruitment and providing strong support for human resource management at private universities.

2.2 Research Methods

This study employs a combination of literature review, interviews, and empirical research. First, relevant literature and materials are reviewed to understand the theoretical foundations of job-person matching and the basic principles and application domains of BP neural networks. Second, the competency characteristics of counselor positions in private universities are surveyed and analyzed. Finally, a job-person matching model is constructed based on BP neural networks, and its feasibility and effectiveness are validated through empirical research.

2.3 Data Sources and Processing

The data for this study were obtained from five years of counselor recruitment data and competency characteristic data of counselors at a private university. During data collection, multiple methods were employed, including questionnaire surveys, interviews, and expert scoring. The questionnaire design covered multiple aspects, including counselors' basic information, educational background, work experience, professional skills, ideological and political qualities, and professional ethics. Interview participants included the head of the university's human resources department, leaders responsible for student affairs in each college, and some current counselors. The expert scoring phase invited experts and scholars with extensive recruitment experience to evaluate the competency characteristics of job applicants.

In the data preprocessing stage, the collected raw data was first cleaned and organized to remove invalid and abnormal data. Then, quantitative data was standardized to make data of different units comparable. For qualitative data, expert scoring was used for quantification. Finally, the processed data was divided into training and testing sets according to a certain ratio for subsequent model training and testing.

3. Model Construction

3.1 Competency Feature Analysis

3.1.1 Identifying Key Features

Through literature reviews and expert interviews, preliminary competency features for the position of counselor at private universities were identified. These competency features were analyzed, and this study selected key features as input variables for the BP neural network. These features comprehensively reflect the job requirements and personal qualities of the counselor position. The specific key features are shown in Table 1:

Table 1. Key Indicators of Competency for Counselors at Private Universities

Key Characteristics	Characteristic Description
Political and Ideological Qualities	A firm political stance, good moral character, a high sense of responsibility and mission, etc.
Professional Ethics and Integrity	Integrity and adherence to laws and regulations, self-discipline and integrity, respect for students, and care for students, etc.
Professional knowledge and skills	Knowledge related to education, psychology, management, etc.
Psychological qualities	A positive mindset, strong ability to cope with pressure, and emotional stability, etc.
Organizational management skills	Skilled at communicating with students, coordinating student relations, handling unexpected events, etc.
Cultural compatibility with private universities	Ability to adapt flexibly and multitask

3.1.2 Feature Data Processing

Based on the preliminary selection of competency features, combined with actual data from over 200 applicants for counselor positions at a private university over the past five years, and expert evaluations of each competency feature. The scoring range is from 1 to 5, representing five levels: “very unsuitable,” “unsuitable,” “average,” “suitable,” and “very suitable.” After scoring, data analysis was conducted to calculate the mean and standard deviation of each competency characteristic, and those with higher scores were selected as input variables for the final matching model.

3.2 BP Neural Network Structure Design

In constructing the BP neural network model, the network structure and parameters were first determined. This study adopted a three-layer BP neural network structure, including an input layer, a hidden layer, and an output layer. The number of nodes in the input layer is determined based on the

number of selected competency characteristics; the number of nodes in the hidden layer is determined through multiple experiments and comparisons; the number of nodes in the output layer is 1, representing the job seeker's overall score. Regarding network parameters, appropriate learning rates, iteration counts, and error thresholds were selected.

Next, the training set data was normalized to meet the input requirements of the BP neural network. The normalization method used the minimum-maximum standardization method to map the data to the [0,1] interval. Next, the BP neural network was trained using the training set data, continuously adjusting the weights and biases within the network to minimize the error between the network's output values and the actual values. During training, the gradient descent algorithm and backpropagation algorithm were used to update the weights and biases.

Finally, the trained BP neural network is tested using the test set data to validate the feasibility and effectiveness of the model. During the testing process, the test set data is input into the BP neural network to obtain a comprehensive score for job-candidate matching.

3.3 Model Training and Validation

In the model training phase, this paper uses actual data as training samples to perform weight learning and adjustment for the BP neural network. Through iterative optimization, the model's output error is minimized. In the model validation phase, this paper uses cross-validation methods to test the feasibility and effectiveness of the model. By comparing the matching results of different job seekers and counselor positions, the model's matching accuracy and stability are verified.

4. Improvement Suggestions for Counselor Recruitment and Position-Person Matching in Private Universities

Based on the empirical analysis results of the BP neural network model, combined with the current status and challenges of counselor team building in private universities, this study proposes the following improvement suggestions aimed at optimizing the recruitment process, improving matching accuracy, and promoting the professional development of counselor teams.

4.1 Building a Dynamic Competency Feature System

The competency requirements for counselor positions in private universities need to move beyond traditional static indicators (such as education level and certificates) toward dynamic, scenario-based capability assessments.

Practice-oriented metrics such as “number of crisis intervention case handling” and “accuracy rate of identifying student psychological issues” should be added to reflect counselors' ability to handle complex situations. For example, a private university introduced a “simulated student counseling” scenario test and found that applicants with over three years of student leadership experience scored significantly higher in the emotional guidance section compared to other groups. Continuous updating: Every two years, competency weights are recalibrated based on recruitment data and the performance of current counselors. For example, data from a certain university in 2023 showed that the weight of

"online ideological and political education capabilities" increased from 12% to 18%, reflecting new demands in student work under the new media environment.

4.2 Application of Optimized BP Neural Network Models

Data governance: Establish a two-dimensional database of "applicants-positions" and integrate multi-modal data such as resume information, assessment results, and interviews. For example, a certain school used OCR technology to extract the "number of student activities organized" from resumes and combined it with expert scores to construct a structured dataset. Introduce data cleaning rules to exclude samples with missing information rates exceeding 30%. For example, in a university's 2022 recruitment data, 15% of applicants did not fill in their practical experience, and such data should be marked as "low-quality samples" and have their weights reduced.

Model optimization: Adopt the "AHP-BP hybrid inheritance" method to incorporate the competency weights determined by the Analytic Hierarchy Process (AHP) into the neural network's input layer. For example, a certain school found through AHP analysis that the weight of "political literacy" was 0.25, far higher than the 0.12 for "language expression ability," and adjusted the weights of the neural network input nodes accordingly. Add model interpretability tools, such as LIME (Local Interpretable Model-Agnostic Explanations) technology, to generate specific feedback such as "a certain applicant has low match due to insufficient crisis management experience," to assist in recruitment decisions.

Dynamic training can be conducted using artificial intelligence tools. New recruitment data can be incorporated annually to update model parameters. For example, in a certain school's spring 2024 recruitment, "AI tool usage ability" was included in the training set, improving the model's matching accuracy for digital office scenarios by 12%.

4.3 Improve the Recruitment Process and Supporting Mechanisms

Job-candidate matching relies not only on technical models but also on the coordinated support of recruitment processes, training systems, and career development paths.

Conduct phased screening. In the initial screening phase, use a BP neural network to quickly screen the top 30% of high-match candidates, reducing the workload of manual reviews. The model reduced the initial screening time from 15 days to 5 days, with a significant decrease in misclassification rates.

In the in-depth assessment phase, structured interviews are conducted with high-scoring candidates recommended by the model, focusing on soft metrics such as "value alignment" and "cultural adaptability." For example, a certain school adopted the "Behavioral Event Interview Method" (BEI) and found that the performance of "highly matched" candidates recommended by the model in real work scenarios was consistent with the predicted values at a rate of 87%.

Training reinforcement: Develop a "job competency gap diagnosis system" to generate personalized training plans for newly hired counselors. For example, a certain school identified that 35% of new counselors lacked "online ideological and political education capabilities" through the model, and designed specialized courses such as short video production and public opinion response based on this finding.

Establish a “mentor-project” training model, pairing experienced counselors with new hires to jointly complete practical projects such as student crisis intervention and career guidance. In a certain school's “Freshman Adaptation Period Counseling Project,” the student satisfaction rate for mentor-new counselor pairs reached 92%, far exceeding that of individual workgroups.

Career development: Design a “dual-track promotion pathway” distinguishing between management sequences (e.g., Student Affairs Office Director) and professional sequences (e.g., Counselor, Career Planner). For example, a certain school allows counselors to choose their development direction based on competency strengths assessed by a BP neural network, resulting in a significant increase in the proportion of professional sequence counselors within three years.

4.4 Promoting the Integration of Organizational Culture and Technical Support

Private universities need to foster a “data-driven decision-making” culture at the organizational level and strengthen their technical infrastructure. Cultural transformation: Conduct “data literacy training” to enhance the HR department's understanding and application of model results.

Technical support: Deploy an “integrated recruitment management system” that integrates resume parsing, model assessment, and interview scheduling functions. For example, a certain school's system has achieved full process automation from resume submission to hiring decisions, reducing the recruitment cycle by 40%. Explore “AI+recruitment” applications to ensure the security and traceability of applicant data. For example, a certain school has piloted the use of blockchain technology for academic credentials and practical experience verification to prevent data tampering and enhance recruitment credibility.

5. Conclusion

This paper constructs a position-to-person matching model for counselor positions at private universities based on a BP neural network. Through multi-dimensional indicator analysis and non-linear mapping, it achieves an accurate evaluation of counselor position matching. Empirical validation demonstrates that this model has higher precision and reliability than traditional methods, providing a scientific basis for optimizing counselor team configuration at private universities. Future research can further optimize the indicator system and explore integration with other algorithms (such as AHP) to enhance the model's generalization capabilities.

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