The Use of the Analytic Hierarchy Process in Improving Psychological Empowerment and Employee Performance

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ABSTRACT

The purpose is to further analyze the influence of AI technology on the psychology of employees in the computer industry and truly solve the problems encountered in enterprise management, such as difficult organizational relationship and lack of staff morale. With artificial intelligence algorithm as the research object, AI-based employee psychology and performance analysis model is built based on artificial neural network (ANN) from four aspects of work performance, psychological empowerment, work engagement, and perceived dynamic work environment. MATLAB tool is used, employee psychological empowerment index is taken as an input variable, and employee performance index is taken as output index. The validity of the models proposed in different studies is further verified through different test methods. The results show that artificial intelligence technology can positively affect employees’ performance by improving their psychological empowerment, and the improvement of work performance is directly related to psychological empowerment.

KEYWORDS
Artificial Intelligence, Deep Learning, Dynamic Work Environment, Psychological Empowerment, Work Perception

INTRODUCTION

All aspects of people’s work and life are changing under the influence of Artificial Intelligence (AI). Some leading companies recognize that AI will significantly impact business models, workforce structure, and the experience customers and employees expect. The combination of AI and strategic insight is bound to create new opportunities and change how human resources departments help enterprises establish competitive advantages (Miloloža, 2018). AI is a general term covering many
fields, such as machine learning and cognitive computing. It is a branch of computer science which aims to use the computer to simulate intelligent behavior.

Moreover, it has been successfully applied in visual perception, natural language processing, speech recognition, speech-to-text conversion, language translation, intonation analysis and other fields (Shuzhen, 2019). AI can help human resources departments make more efficient and full use of funds, change the mode of human resource expenditure, make it achieve higher value, solve more complex problems, and reduce the work intensity of employees who perform daily human resource query tasks. In this way, it helps to reduce the cost of human resources, reinvest the saved funds in other AI projects, and enhance the ability of the human resources department, including coping with business challenges, continuously cultivating strategic skills, creating a positive work experience, and providing excellent decision support for employees (Rosmawati & Mayndarto, 2020). After deploying AI, the human resources department can target ideal candidates before job seekers apply for positions. In the stage of attracting job seekers in the talent life cycle, the goal of enterprises is to recruit as many candidates as possible who have the skills required for a specific position and encourage them to apply for the role after confirming that they meet the requirements (Young et al., 2018). Using professional chat robots is a typical example of using AI to attract job seekers. Natural language processing technology can be adopted to interpret and answer job seekers’ questions by deploying chat robots to attract job seekers. Potential job seekers can learn more about the enterprise before applying for a position with this technology. In the modern era, it has become a compulsory course for talents to thoroughly study the enterprise status and brand reputation before applying for a position. Moreover, compared with the traditional method based on keyword search, the matching position effect of the AI method is better (Jin & McDonald, 2017). The job characteristics of recruiters are tight time and heavy tasks, and they often need to recruit multiple positions simultaneously. They need to prioritize all kinds of positions they are responsible for recruiting and find the best candidate from many job seekers competing for the same position (Gawke et al., 2017). If they cannot deal with these challenges effectively, they may mistakenly prioritize the recruitment positions; even if the priorities are right, they may choose the wrong candidate. In this case, AI can predict the time needed to fill the position vacancies according to historical data, and support recruiters to re-prioritize according to needs (Dust et al., 2018; Dai, 2022). Hence, research on the application of AI in human resource management has great prospects.

Enterprises need to upgrade the internal learning system and choose the enterprise intelligent learning system with the deep application of AI technology. With the intelligent learning system, based on the internal data of the enterprise, the enterprises can accurately understand the knowledge structure of each position from tens of millions of data of the whole network, draw a high-precision position map, accurately locate the role and skill level of employees, to better plan the personalized learning path of employees, and effectively improve the existing enterprise learning problems (Mhlanga, 2020), such as employees are not active in learning and are not closely integrated with the business; data-driven enterprise learning means that enterprises use modern technology to collect multidimensional employee data and massive content data, integrate and refine these data information, and then form an automatic learning decision-making model for each employee through training and fitting. Its biggest feature is that it has a complete process from data collection, sorting, and reporting to learning analysis and decision-making suggestions. It can provide learning content to meet employees’ current and future needs according to the changes of internal and external conditions of employees, industry, and market. Besides, it also provides decision support for the relevant personnel of the enterprise to carry out the deployment of learning strategy (Rahim et al., 2018); in enterprise learning, it is particularly important to locate the nearest development area of each employee dynamically. The reason is that only by linking employees’ learning with what has happened, is happening or will happen in their work based on their current skill level, can they easily transform their learned knowledge into experience and ability in their future work (Khanjankhani et al., 2017); deep learning is an algorithm based on data representation learning in machine learning (Rahmanidoust & Zheng, 2019; Liu & Chen, 2023).
Therefore, it is of great practical value to apply the algorithms related to deep learning to the data analysis of enterprise personnel management.

According to the theory of internal motivation, the intrinsic motivation of psychological empowerment is an individual’s endogenous state, which depends on the individual’s experience, preference and cognition of the environment (Li et al., 2018). Zhang et al. (2018) found that psychological empowerment, as an essential internal motivation force, mainly reflects self-esteem and self-efficacy of self-concept. Compared with traditional structural empowerment, psychological empowerment focuses on employees’ empowerment psychology (Sun, 2016). According to the theory of psychological empowerment, the psychological state of employees can stimulate employees’ intrinsic work motivation, thus improving work efficiency (Kang et al., 2017). As a new management method, whether psychological empowerment will affect the job performance of knowledge workers and the degree of influence is worth further discussion (Aydoğanış, 2019; Lu et al., 2022). Kundu et al. (2019) found that the research on the impact of psychological empowerment on employees' work performance is relatively small, and the research conclusions are inconsistent. Exploring the impact of psychological empowerment on knowledge workers’ job performance through AI method, on the one hand, can verify the effectiveness of psychological empowerment (Lei et al., 2022). On the other hand, it can provide a new perspective for enterprises to improve the performance level of knowledge workers.

Therefore, based on previous studies, AI technology and artificial neural network (ANN) are adopted to construct an AI employee psychology analysis model based on deep learning. After the comprehensive analysis of the impact of psychological empowerment on individual characteristics and environment, the relationship between psychological empowerment and work performance is established based on ANN through the input of questionnaire data. Analysis of multiple data further clarifies the relationship between work performance and psychological empowerment. This exploration can provide theoretical research ideas and practical value for exploring the application of AI technology in enterprise management.

**RESEARCH METHOD**

**Analysis Method**

**Conventional Analysis**

To explore the influence mechanism of psychological empowerment on job performance, the combination of theoretical research and empirical research, the combination of qualitative analysis and quantitative analysis is adopted. The specific research methods are as follows. (1) Literature research method: through the information channels such as database resources and journals, the related research literature of high-quality journals in organizational behavior is sorted out, and the literature review on five important variables is carried out respectively. Based on a mature theoretical origin and empirical research results, the theoretical model and research hypothesis are sorted out. (2) Questionnaire survey method: all variables involved are measured from the mature scale developed by scholars in China and foreign countries. According to the actual situation of the enterprise, targeted recall and adjustment is carried out. To ensure the authenticity and reliability of the data, the structure of the scale is analyzed and verified by a small sample survey in the early stage. (3) Statistical analysis method: SPSS20.0 statistical analysis and AMOS21.0 structural equation analysis software are used to test the overall theoretical model and variables.

**AHP**

AHP is a multi-level weight decision-making method proposed by Professor Saaty, an American operational research scientist, in the 1970s. The basic idea is to form a hierarchical structure of the relevant elements of the decision-making problem according to the dominant coefficient, objectively
quantify the subjective judgment of experts with a certain scale, construct a judgment matrix, and calculate the weight coefficient of each index on this basis (Chan et al., 2019; Meng et al., 2022; Hu & Chen, 2022). The specific steps of AHP to determine the subjective weight of indexes are as follows. (1) Construction of judgment matrix: judgment matrix represents the comparison of relative importance between the level and its related factors for the factors at the previous level. To make the decision-making judgment quantitative, the commonly used 1-9 scale method is used. (2) Calculation of the index weight: the root method calculates the maximum eigenvalue of the judgment matrix and its corresponding eigenvector. (3) Consistency test of judgment matrix: the judgment matrix between the two indexes is as follows.

\[
A = \begin{pmatrix} \frac{W_1}{W_1} & \cdots & \frac{W_i}{W_i} & \cdots & \frac{W_n}{W_n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ \frac{W_n}{W_1} & \cdots & \frac{W_n}{W_i} & \cdots & \frac{W_n}{W_n} \end{pmatrix} = (a_{ij})_n \times n
\]

It satisfies (1) \( a_{ii} = 1, (i = 1, 2, 3, \cdots n) \) and (2)

\[
a_{ij} = 1 / a_{ij}, (I, j = 1, 2, 3, \cdots n)
\]
\[
a_{ij} = a_{ik} / a_{jk}, (I, k = 1, 2, 3, \cdots n).
\]

Therefore, it can be obtained that:

\[
AW = \begin{pmatrix} \frac{W_1}{W_1} & \cdots & \frac{W_i}{W_i} & \cdots & \frac{W_n}{W_n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ \frac{W_n}{W_1} & \cdots & \frac{W_n}{W_i} & \cdots & \frac{W_n}{W_n} \end{pmatrix} = n
\]

\[
\begin{pmatrix} W_1 \\ W_2 \\ \vdots \\ W_n \end{pmatrix} = nW
\]

\( W_i \) is the weight coefficient of each data, \( a_{ij} \) is the matrix accumulation, and \( n \) is the number of matrices. Generally, when CR is less than 0.1, the inconsistency degree of judgment matrix is within the allowable range. Otherwise, the judgment matrix needs to be reconstructed.

**AI Technology**

Present AI technology is mainly machine learning, which is divided into supervised and unsupervised learning. Supervised learning is a method in machine learning, which can learn from training materials or establish a learning model, and infer new examples according to this model. Training data consists of input objects (usually vectors) and expected outputs. The function’s output can be a continuous value (called regression analysis), or it can predict a classification label (called classification). Unsupervised learning is an algorithm of AI network. Its purpose is to classify the original data to understand the internal structure of data. Different from supervised learning network, an unsupervised learning network does not know whether its classification result is correct or not, that is, it is not enhanced by supervision (telling it what kind of learning is right). It is characterized by only providing input examples for such networks, and it will automatically find out its potential class rules from these examples (Zhang & Bartol, 2010).

Among them, the most commonly used is ANN. Neural network is a kind of supervised learning algorithm composed of input layer, hidden layer and output layer. It forms a complete connection between
layer and layer neurons. According to the learning process, it can be divided into forward propagation and backpropagation. Among them, forward propagation is from the input layer to the hidden layer and then to the output layer. In contrast, backpropagation is the way of forward signal propagation from the output layer, and each layer transmission is limited by weight. The data information is processed by the combination of neuron activation function, hidden layer neuron number and weight adjustment rules, which can realize different network functions. Figure 1 is the specific structure.

Where the input vector should be:

\[ x = [x_1, x_2, x_3, \ldots, x_i, \ldots, x_m], \ i = 1, 2, \ldots, m \]  
\[ (4) \]

The output vector should be:

\[ y = [y_1, y_2, y_3, \ldots, y_k, \ldots, y_n], \ k = 1, 2, \ldots, n \]  
\[ (5) \]

The input of neurons in the hidden layer should be as follows:

\[ h^{(l)} = [h^{(l)}_1, h^{(l)}_2, h^{(l)}_3, \ldots, h^{(l)}_j, \ldots, h^{(l)}_s], \ j = 1, 2, \ldots, s_l \]  
\[ (6) \]

Where \( s_l \) is the number of neurons in layer \( l \). If \( w^{(l)}_{ij} \) is the connection weight between the \( j \)-th neurons in layer \( l-1 \), \( b^{(l)}_i \) is the threshold value of \( i \) neurons in layer \( l \), and \( net^{(l)}_i \) is the input of \( i \) neurons in layer \( l \), it can be obtained that:

\[ h^{(l)}_i = f(net^{(l)}_i) \]  
\[ (7) \]

\[ net^{(l)}_i = \sum_{j=1}^{s_{l-1}} w^{(l)}_{ij} h^{(l-1)}_j + b^{(l)}_i \]  
\[ (8) \]

From the input layer to the output layer, the TANSIG function corresponding to S-type is used, and the PURELIN linear function is used in the output layer. TRAINGDX function is used for learning rules and MES function is used for performance evaluation. Among them, the model number is set to 1000 times, the precision is set to 0.0001, and the rest are the default parameters of the system.

**Theoretical Hypothesis**

*Psychological Empowerment and Job Performance*

Psychological empowerment positively correlates with management effectiveness and employee efficiency (Chian & Hsieh, 2012). Meta analysis of the result variables of psychological empowerment also shows that task performance is the main outcome variable, and there is a significant positive correlation between psychological empowerment and job performance (Adib-Hajbaghery et al., 2012). Academic research on the relationship between psychological empowerment and job performance can be divided into theoretical analysis and empirical research.

In terms of theoretical analysis, scholars have introduced employee perception factors into the study of performance influencing factors, believing that employees who have a better understanding of their work are in a more favorable position in planning and arranging work so that they can better find and solve difficulties and achieve good performance (Bhatnagar, 2012). In addition, some scholars believe that employees with higher psychological empowerment think they are competent for the job and can influence their work and working environment through meaningful work methods. Therefore,
these employees will exercise their work responsibilities more actively and work efficiency will be higher (Kuvaas & Dysvik, 2009; Chen & Du, 2022). Some scholars also pointed out that those employees who think their work is meaningful and those who have influence inside and outside the organization by completing their work tasks will be given an internal incentive to show better job performance (Jaiswal & Dhar, 2016; Zhang et al., 2022; Feng et al., 2021).

In terms of empirical research, the empirical research on the relationship between psychological empowerment and hotel service quality confirms that the three dimensions of psychological empowerment have an impact on the service quality of hotel staff (Joo & Shim, 2010); the empirical research on the work performance of knowledge workers shows that psychological empowerment and its four dimensions have significant positive correlation with knowledge employees’ work performance. Psychological empowerment perception has a direct impact on their job performance (Newman et al., 2017); some studies have shown that there is a significant positive correlation between empowerment and job performance, and empowerment can effectively predict task performance, contextual performance and job performance; some studies also show that psychological empowerment is positively correlated with organizational citizenship behavior and job performance of subordinates. However, Dewettinck et al. (2004) found that psychological empowerment can improve employees’ job satisfaction and organizational commitment, but the impact on employees’ job performance is not apparent. Therefore, it is necessary further to explore the effect of empowerment on employee performance. Starting from the different dimensions of psychological empowerment, (Linden et al., 2000) applied the psychological empowerment four-dimensional structure scale, and found that the competency dimension had a significant positive impact on job performance; Humphrey et al. (2007) proved that the decision-making power was significantly related to personal performance; perceived work influence can also improve employee task performance by improving work effort and persistence. Therefore, the following assumptions are put forward.

**H1:** Psychological empowerment is positively correlated with employee performance.
The Regulation of Work Input

According to the JD-R model, each workplace has its specific requirements and resources. Job demands refer to the particular wishes or conditions put forward for the work, which is employees' passive acceptance of the company’s work. Job resources are the basis for employees to complete their work effectively, and their work engagement cannot be separated from the support of work resources (Bakker & Demerouti, 2007). The goals are the following: to achieve work objectives; to reduce physical and psychological costs related to job requirements; and to stimulate interest in work to promote personal growth, learning and development (Xanthopoulou et al., 2007). When there are substantial work resources, engagement and performance will improve (Kohn & Schooler, 1982). Employees with higher personal resources will better adapt to their work environments (Ugwu et al., 2014). Individual resources can explain why work resources can influence work engagement and thus improve work performance. Psychological empowerment can inspire positive relationships between job resources, personal resources, and work engagement (Van der Voet & Vermeeren, 2014; Raub & Robert, 2010; Jose & Mampilly, 2015).

When employees have a high level of work engagement, they can fully engage in their work and their performance will be improved. Wang et al. (2015) selected 175 flight attendants and 181 hotel employees as the research objects, and concluded that work engagement could fully mediated the relationship between job crafting and job performance. By using matched supervisor-subordinate data collected from a financial credit company in Mexico (654 subordinates; 134 supervisors), Rofcanin et al. (2016) concluded that family-supportive supervisor behaviors (FSSBs) influenced work performance through subordinate work engagement. Employees with a high level of work engagement identify with their job and care about their work. Based on the above research, this paper believes that psychological empowerment of employees is a valuable attribute that intrinsically motivates employees to produce more work resources, thus improving their work performance. Therefore, this study proposes the following hypothesis:

H2: Work engagement plays a mediating role in the relationship between psychological empowerment and job performance.

The Moderating Effect of Perceived Dynamic Work Environment

According to the resource conservation theory, the level of work resources and the difficulty of work requirements comprise the work environment (Hobfoll, 2001). Perceived dynamic work environment can lead to stress among the employees, and the changing work environment can easily trigger their defense mechanisms. Companies want to retain employees, instead of having to incur costs to replace them. Perceived dynamic work environment is part of any job according to the definition of job requirements in the JD-R model. Studies show that job requirements are not necessarily negative; however, when employees try their best to complete onerous requirements, they may become a source of stress, leading to employee burnout (Meijman et al., 1998). Sometimes a firm cannot predict perceived dynamic work environment, as in a pandemic. A perceived dynamic work environment can occur because a lack of available information can also affect resources. Finishing the work may require more physiological and psychological energy, and they become exhausted. Perceived dynamic work environment may affect employee incentives and will further affect job performance. The profit and loss of the individual resources will cause damage to the positive results of psychological empowerment (Feng & Chen, 2022).

To sum up, this study believes that perceived dynamic work environment breaks the stability of the work environment, increases work requirements, and reduces work resources. This affects employees' work engagement and reduces the positive effects of psychological empowerment on work performance. Therefore, this study proposes the following hypothesis:
H3: Perceived dynamic work environment affects the positive correlation between psychological empowerment and work engagement; the higher the level of perceived dynamic work environment, the lower the level of employee engagement.

Data Sources
The field paper questionnaire and electronic network questionnaire are two ways of data collection. To reduce the concerns of the respondents, reduce their psychological defense and improve the authenticity of the questionnaire, it is necessary to explain the purpose of the research and the matters needing attention to fill in the questionnaire to the subjects before the questionnaire is issued. Anonymous filling method is adopted to ensure that the data is only used for research and will not reveal information. The survey was conducted from April 2017 to June 2017, involving psychological empowerment, work engagement and perception of dynamic work environment. The electronic questionnaire is sent out through Wenjuanxing, alumni group and other network tools. A total of 400 questionnaires are distributed to a state-owned enterprise in Jiangsu Province. 321 questionnaires are collected, and the recovery rate is 80.25%. After the questionnaires are collected, questionnaires with repeated answers, missing data of some questions, or filling with obvious perfunctory situations are eliminated. 296 valid questionnaires are obtained, and the effective rate is 92.21%.

Questionnaire Content

Psychological Empowerment
The psychological empowerment questionnaire developed by (Spreitzer, 1995) was adopted. There are 12 items in total, including 4 sub-dimensions of work meaning, competence, self-determination, and influence. The 5-point Likert’s scale was used, with 1 representing “strongly disagree,” 3 representing “uncertain”, and 5 representing “fully agree”. For example, “What I am doing now is very meaningful to me personally”. In this study, $\alpha = 0.890$.

Job Performance
Task performance questionnaire developed by (Farh et al., 1991) was adopted. There were three items. The 5-point Likert’s scale was used, with 1 representing “strongly disagree,” 3 representing “uncertain”, and 5 representing “fully agree”.

Work Engagement
The work engagement questionnaire developed by (Schaufeli et al., 2006) was adopted. There were 9 items in total, including the 3 sub-dimensions of vitality, dedication and concentration. The 5-point Likert’s scale was used, with 1 representing “strongly disagree,” 3 representing “uncertain”, and 5 representing “fully agree”. For example, “When I am in work, I feel that I am strong and energetic,” “I am passionate about my work,” and “When I am at work, time flies”. In this study, $\alpha = 0.893$. (Not 17 rather 9, refers to formal writing of procedural justice).

Perceived Dynamic Work Environment
The perceived dynamic work environment questionnaire developed by (Hoogh et al., 2005) was adopted based on three items: ‘What is the extent of challenge in your work environment?’ ‘To which degree is your work environment dynamic?’, and ‘To what extent does your work environment offer great opportunities for change?’ The items were rated on a 5-point response scale, ranging from 1 (not at all) to 5(very much so). The dynamic work environment scale had an alpha coefficient of 0.785.
Data Analysis

Reliability Analysis

The reliability is analyzed by Cronbach’s coefficient method of (Hadjichambis & Paraskeva-Hadjichambi, 2020). When the coefficient is between 0.7 and 0.8, it shows that the questionnaire survey results have high reliability; when the coefficient is between 0.65 and 0.7, the reliability is acceptable; when the coefficient is between 0.6 and 0.65, the reliability of the questionnaire survey results is not credible (Yurdugül, 2008).

Validity Analysis

The ratio statistic test (RST) method proposed by (Fan & Wang, 2016) is used to judge by redundancy and sensitivity. Redundancy degree (RD) represents the independence and redundancy of each index. When RD ≤ 0.5, the index is valid. The smaller the value is, the higher the validity is; the sensitivity degree (SD) is the adaptability of different evaluation systems to evaluation indexes. When SD ≤ 5, the index is valid. Before modeling, all data are normalized. The calculation method used is to calculate the final score of each index by means of average weighting for all results, and the normalized interval is in [0, 1]. The specific calculation equation is as follows.

\[
X = \frac{x - x_{\text{min}}}{x_{\text{max}} - x_{\text{min}}} \tag{9}
\]

\(x\) is the data value, \(x_{\text{min}}\) is the minimum value of all data, and \(x_{\text{max}}\) is the maximum value of all data. In order to reduce the error effectively, the consistency of all matrices is checked. The specific calculation equation is as follows.

\[
CI = (\lambda_{\text{max}} - n) / (n - 1) \tag{10}
\]

Where \(\lambda_{\text{max}}\) is the maximum eigenvalue and is the average value of \(A_{wI}/wI\) \(wI\) is the sum of the sub vectors of each row of the matrix multiplied by the weight \(W\). \(A_{wI}/wI\) is the divisor of the matrix and its corresponding vector. \(n\) is the number of data. The average random consistency index RI is also used to determine the approximate range of the inconsistency. The consistency ratio CR (CR = CI / RI) is used to judge whether the matrix is consistent (when CR < 0.1, the judgment matrix is consistent). SPSS19.0 is used to analyze the survey data, including reliability analysis, descriptive analysis, correlation analysis, multiple linear regression analysis; AMOS21.0 is used to analyze the data, including confirmatory factor analysis and structural equation model analysis.

Regulation Effect Analysis

Whether the variables controlled by multiple factors have significant influence on the observed variables is studied, and the influence relationship between variables can be obtained. Multi factor analysis of variance of (Campbell & Kulis, 2018) is used. If the P value is less than the significance level (0.05), there is a significant difference between the control and observation variables. On the contrary, if the P value is greater than the significance level (0.05), there is no significant difference between the control and observation variables. Regulatory effect analysis: AHP of (ALOthman & Wabaidur, 2019) is adopted, and the regression model with product term is used for adjustment analysis. In the regression model, after adding independent or adjusted external variables, focus should be the correlation between independent variables and adjusted dependent variables, and then the values of independent variables and adjusted dependent variables are optimized.
RESEARCH ANALYSIS

Analysis Model of Psychological Empowerment and Job Performance Based on ANN

An ANN-based psychological empowerment and job performance analysis model is constructed according to the above theory, and Figure 2 is the specific structure to analyse the relationship between psychological empowerment and employee job performance. The analysis is carried out from three structures. The first is the data collection and analysis, mainly with the help of questionnaire, using SPSS20.0 and AMOS21.0 to carry on the statistical analysis to the data. Then, ANN is used to train all the data to understand the influence of psychological empowerment on employees’ job performance. Finally, according to the evaluation method of employee’s job performance, the relationship between them can be obtained from error and model performance.

Questionnaire Data Test

To verify the validity of the questionnaire results, the consistency of the collected data is tested. The first is normalization, and Table 1 shows the results. The results show that the differences of RI values in the four dimensions are large, revealing that all survey data’s deviation is small.

In the construction of judgment matrix, there may be logical errors, such as A is more important than B, B is more important than C, but C is more important than A. Therefore, it is necessary to use the consistency test to see if there is any problem, and the CR value is used in consistency test for analysis. If the CR value is less than 0.1, it means that the consistency test has been passed; otherwise, it means that the consistency test has not been passed. If the data fails to pass the consistency test, it is necessary to check whether there are logical problems, and re-enter the judgment matrix for analysis. In the CR, CR=CI/RI calculation, the CI value has been obtained in the eigenvector calculation, and the RI value is directly obtained by looking up the table. Table 2 shows the results, in which xmax is λmax, and all values are less than 0.1, so it can be judged that the results are reasonable and the model is consistent.

Figure 2.
Analysis model of psychological empowerment and job performance based on ANN

Table 1
Index weight values

<table>
<thead>
<tr>
<th>Order</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td>RI</td>
<td>0</td>
<td>0</td>
<td>0.58</td>
<td>0.90</td>
</tr>
</tbody>
</table>
Figure 3 shows the results of the effectiveness test of the indexes. According to the values of redundancy and sensitivity, RD is 0.224, SD is 1.537, which further indicates the validity of the questionnaire data collected.

**Factor Analysis Results**

Figure 4 shows the results of confirmatory factor analysis for four variables. It shows that the validity of the four-factor model is better than that of the three-factor, two-factor and single factor model. $\chi^2 (84) = 112.468, \ P < 0.001$, CFI = 0.962, TLI = 0.945, SRMR = 0.039, RMSEA = 0.073. It indicates that the four variables have good discriminant validity. This further proves that the proposed psychological empowerment, work engagement, job performance and perceived dynamic work environment have good differences, and no large cross content exists.

**Correlation Analysis Results**

Table 3 shows each variable’s mean, standard deviation, and correlation coefficient. As can be seen from Table 5, there is a positive correlation between psychological empowerment and job performance ($r=0.55, \ P < 0.01$), and H1 is true. There was a positive correlation between psychological empowerment and work engagement ($r=0.70, \ P < 0.01$). There was a significant correlation between...
work engagement and job performance ($r = 0.49, p < 0.01$), and there was also a significant positive correlation between work engagement and perceived dynamic work environment ($r = 0.58, p < 0.01$). In addition, there was a significant positive correlation between job performance and perceived dynamic work environment ($r = 0.39, p < 0.01$).

**Model Performance Analysis**

To verify the effectiveness of the proposed model, a comparative study is carried out with the traditional employee performance analysis model, and Figure 5 shows the results. It reveals that the model’s performance is improving as the number of iterations increases. Compared with the traditional model, the average prediction accuracy of ANN proposed in this exploration is 83%, while the prediction conventional model accuracy is 49.15%, and the accuracy is improved by 40.78%. It reveals that the psychological empowerment and employee performance model based on AI technology can effectively reflect the relationship between employees’ psychology and performance.
Table 3
Correlation coefficient between mean value, standard deviation, and variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Gender</td>
<td>1.45</td>
<td>0.50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.Age</td>
<td>1.58</td>
<td>0.62</td>
<td>0.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.Educational Background</td>
<td>3.03</td>
<td>0.88</td>
<td>-0.11</td>
<td>0.12*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.Tenure</td>
<td>2.26</td>
<td>1.00</td>
<td>0.04</td>
<td>0.51**</td>
<td>0.13*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.Psychological Empowerment</td>
<td>3.58</td>
<td>0.60</td>
<td>-0.13*</td>
<td>-0.07</td>
<td>-0.21**</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.Work engagement</td>
<td>3.37</td>
<td>0.69</td>
<td>-0.07</td>
<td>-0.03</td>
<td>-0.20**</td>
<td>0.02</td>
<td>0.70**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.Job performance</td>
<td>3.79</td>
<td>0.67</td>
<td>-0.05</td>
<td>-0.03</td>
<td>-0.05</td>
<td>-0.05</td>
<td>0.55**</td>
<td>0.49**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.Perceived dynamic work</td>
<td>3.36</td>
<td>0.84</td>
<td>-0.15*</td>
<td>-0.10</td>
<td>-0.22**</td>
<td>-0.12*</td>
<td>0.50**</td>
<td>0.58**</td>
<td>0.39**</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: Quantity of employee sample N: 286; For gender, male = 1, female = 0; For education level, high school = 1, junior college = 2, bachelor’s degree = 3, master degree or above = 4; The internal consistency coefficient is indicated in brackets along the diagonal.

* p < 0.05, ** p < 0.01, and *** p < 0.001.

Analysis Results of Regulation Effect

Table 4 shows the results of hierarchical regression analysis. It shows that in all models, gender, age, length of service and education level are used as control variables. Model 1 shows that psychological empowerment has a positive effect on job engagement ($\beta = 0.701$, p < 0.01; model 2 show that psychological empowerment has a positive impact on job performance ($\beta = 0.582$, p < 0.01). Model 3 shows that work engagement positively affects job performance ($\beta = 0.497$, p < 0.01). Psychological

![Figure 5. Performance analysis of different models](image-url)
empowerment is positively correlated with job performance and job engagement, and job engagement is also positively correlated with job performance. In model 4, psychological empowerment and work engagement are included in the regression equation; work engagement is positively correlated with job performance (β = 0.197, p < 0.01), and psychological empowerment is given a predictive role (β = 0.444, p < 0.01), but the role of psychological empowerment and work engagement in the prediction is reduced. Therefore, hypothesis 2 is supported, and work engagement directly impacts psychological empowerment and job performance.

Table 5 shows the results of adjustment effect analysis for job engagement and perceived dynamic work environment. Table 5 shows that the indirect effect of work engagement is significant (a * b = 0.1533, p < 0.01), and the confidence interval CI = [0.0254, 0.3250], excluding zero, so the H2 hypothesis is supported. The interaction between psychological empowerment and perceived dynamic work environment is significantly correlated with work engagement (0.114, p < 0.05), indicating that perceived dynamic work environment moderates the relationship between psychological empowerment and work engagement.

Figure 6 is the indirect impact test results under different conditions. It shows that the regression results of psychological empowerment and work engagement with perceived dynamic work environment are higher than 1 standard deviation, and the mediating effect of work engagement is insignificant (indirect effect = 0.14, p < 0.05). When the perceived dynamic work environment level is high, psychological empowerment’s influence on work engagement is enhanced. In the range of psychological empowerment and work engagement, the perceived level of dynamic work environment plays a positive role, and the moderating effect is positively correlated, which is also confirmed in Figure 7. These results indicate that the higher the perceived dynamic work environment, the stronger the mediating role of work engagement between psychological empowerment and job performance.

**DISCUSSION AND SUGGESTIONS**

In the conclusion of the empirical study, the positive impact of psychological empowerment on employees’ work engagement does not decrease with the improvement of the level of the perceived dynamic work environment (table 7-8), which may be the result of the interaction between individual factors and environmental factors. According to the interaction model of work stress, it is found that individuals’ perception and evaluation of things are different, and the consequences of work stress are also different. (Savanevičienė et al., 2019) found that the influence of autonomy.

**Table 4**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Work Engagement</th>
<th>Performance</th>
<th>Performance</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Mode 2</td>
<td>Mode 3</td>
<td>Model 4</td>
</tr>
<tr>
<td>Gender</td>
<td>0.016</td>
<td>0.034</td>
<td>-0.011</td>
<td>0.031</td>
</tr>
<tr>
<td>Age</td>
<td>0.047</td>
<td>0.062</td>
<td>0.010</td>
<td>0.053</td>
</tr>
<tr>
<td>Educational Background</td>
<td>-0.053</td>
<td>0.081</td>
<td>0.054</td>
<td>0.091</td>
</tr>
<tr>
<td>Service Duration</td>
<td>-0.037</td>
<td>-0.123*</td>
<td>-0.068</td>
<td>-0.116*</td>
</tr>
<tr>
<td>Psychological Empowerment</td>
<td>0.701***</td>
<td>0.582***</td>
<td>0.497***</td>
<td>0.197**</td>
</tr>
<tr>
<td>Work engagement</td>
<td>0.491</td>
<td>0.306</td>
<td>0.323</td>
<td>0.323</td>
</tr>
</tbody>
</table>

Note: * p < 0.05, ** p < 0.01, and *** p < 0.001; N = 286; the coefficients reported in the Table are standardized regression coefficients.
feedback, trust and leadership in work on employees of all ages is different, so employees of different ages have different understanding of the stress caused by environment, which is consistent with the conclusion of this study. Psychological empowerment is a comprehensive perception

Table 5
Perceived dynamic work environment

<table>
<thead>
<tr>
<th></th>
<th>Perceived Dynamic Work Environment Job Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
</tr>
<tr>
<td>Control variable</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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</tr>
<tr>
<td>Age</td>
<td>-0.008</td>
</tr>
<tr>
<td>Educational Background</td>
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<tr>
<td>Service duration</td>
<td>-0.033</td>
</tr>
<tr>
<td>Main Effect</td>
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<tr>
<td>Psychological Empowerment</td>
<td>0.505***</td>
</tr>
<tr>
<td>Work engagement</td>
<td></td>
</tr>
<tr>
<td>Moderating Effect</td>
<td></td>
</tr>
<tr>
<td>Psychological Empowerment* perceived dynamic work environment</td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>-0.007</td>
</tr>
<tr>
<td>ΔR²</td>
<td></td>
</tr>
</tbody>
</table>

Note: * p < 0.05, ** p < 0.01, and *** p < 0.001; N=286; the coefficients reported in the table are standardized regression coefficients.

Figure 6.1
Indirect effects test of different conditions (bootstrap=2,000)
of the working environment and a positive personal resource. Therefore, the higher the level of psychological empowerment, the more positive the employees’ comprehensive perception and evaluation of work environment. (Fan et al., 2016) found that perceived work environment can lead to more work engagement by promoting the development of psychological empowerment. (Singh & Singh, 2019) found that organizational management positively and significantly affects psychological empowerment, which can directly stimulate employees to maintain a positive attitude towards perceived environment, which is consistent with the conclusion of this study. Therefore, the perception and evaluation of employees’ perception of dynamic work environment may not be threats or resistance, but job challenges and opportunities. Challenge pressure makes individuals think that their efforts can better achieve their goals and improve work motivation. In the face of perceived dynamic work environment, employees with high level of psychological empowerment have more positive comprehensive perception and evaluation of the environment, which further improves their work motivation and makes them work harder. Therefore, under the influence of perceived dynamic work environment, the positive effect of psychological empowerment on work engagement does not decrease, but increases.

Progress has been made in applying “deep learning” and “machine intelligence” of AI. This change marks a real subversion, which can create wealth and bring huge social benefits. In terms of training and development, AI can significantly reduce the cost of money and time for enterprise training. For example, enterprises can develop training software according to their own actual situation, and use simulation technology, simulation switching operation perspective and other ways to let employees use fragmented time to receive training, to improve significantly the training effect. In the aspect of performance management, AI can also be used to scientifically and rationally match the performance evaluation indexes with the actual working conditions of employees, so as to reduce the impact of subjective evaluation in performance evaluation, and make the assessment results more accurate and convincing. Regarding salary and welfare management, human resource
management practitioners can choose the “man-machine combination”. For example, they can fully consider the principle of salary design and design an intelligent salary system by combining the salary level of many benchmarking positions, including the influence of factors such as the per capita income and consumption level of the city. First, the company’s status, staffing, business development and other basic information are input and sent to the AI model for preliminary calculation. Then, the professionals will fine tune according to the actual situation to form the basic salary scheme. In this way, it reduces the subjective influence of HR in salary determination, and makes the design of enterprise compensation scheme fairer and more reasonable. In the aspect of labor relations management, the use of AI can significantly improve the work efficiency of HR staff. For example, the use of the resource planning system can run through all aspects of human resource management. It can handle attendance, leave, approval and other affairs online, and answer the relevant confusion of staff in other departments for human resources work to make the work more humanized, automated and convenient.

Therefore, according to the research content, relevant suggestions are given to enterprises. First, managers are encouraged to use psychological empowerment correctly by studying the theory of successful implementation. Although psychological empowerment is difficult to observe and measure, managers can exert influence on employees through structural empowerment. For example, enterprise leaders should pay attention to the internal needs of employees, encourage employees to participate in management decisions, listen to their opinions and ideas, so as to strengthen communication. Discussing and sharing information related to enterprise reform with employees will enhance their psychological power. Then, for large companies, especially those in the stage of transformation, merger or reorganization, the efficiency of organizational operation is the key to adapt to the new environment. It can continuously motivate employees to participate in work better by enhancing their psychological power to improve their work performance. Finally, enterprises cannot control when perceived dynamic work environment will appear, such as epidemics, which will have a negative impact on employees and the company. In the face of the perceived dynamic work environment, there should still be clear boundaries to prevent rumors, false information and counterproductive behavior. In the strict top-down hierarchical structure, it is necessary to interact with employees to cope with the perceived dynamic work environment, improve organizational flexibility and vitality, and stimulate employees’ internal motivation. The organizational structure of an enterprise should cultivate a cooperative working environment, such as improving work design, implementing post rotation system and competitive employment system, and encouraging and valuing employees’ opinions.

CONCLUSION

On the basis of summarizing the previous research results, JD-R model and resource saving theory is used. With the aid of AI, ANN and AHP, a job performance model based on psychological empowerment is built. The demand analysis model can be used to solve the actual management problems of enterprises. The average accuracy of the model is higher, and the prediction accuracy of the model is greatly improved compared with the traditional model (Ye & Chen, 2021; Zhao et al., 2022). There is a positive correlation between psychological empowerment and job performance. Psychological empowerment can affect job performance by influencing the degree of work engagement; perceived dynamic work environment can effectively adjust the relationship between psychological empowerment and job performance. Although the model of employees’ psychology and needs has been constructed, this exploration still has some deficiencies. First, although ANN is used, there is no public database, so the model’s training is limited, leading to low prediction accuracy; second, the overall atmosphere of different regions is different, and the factors of psychological empowerment are also different. In view of the above problems, the future research can focus on these aspects. First, datasets from different industries and companies can
be built. Then, the scope of research can be further expanded and the role of personal resources in the organization can be further analyzed, which will help human resources evaluation, develop and promote better job performance. Finally, combined with political, economic, cultural and other factors, the scope of research is expanded to clarify the boundary conditions of different variables on psychological empowerment.

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