Performance Analysis of Corporate Human Resource Management from the Perspective of Social Network Analysis

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Abstract: From the perspective of social relationship network analysis, this paper discusses the influencing factors and enhancement strategies of enterprise human resource management performance. Based on the social relationship network theory, the influence mechanisms of relationship structure, interaction frequency, and information flow among employees on HRM performance are analyzed by constructing an internal network model of the enterprise. The article reveals the role of different network characteristics in teamwork, knowledge sharing, and employee performance improvement through key network indicators such as network density, centrality, and structural holes. Combined with case studies and empirical research, this article proposes management strategies to optimize employee relationship networks and verifies the effectiveness of HR performance improvement methods based on social relationship network analysis. The study shows that scientific relationship network management helps enterprises better achieve human resource allocation optimization and performance improvement, and promotes the improvement of overall organizational efficiency.

1. Introduction

As one of the key factors for organizational success, corporate human resource management not only affects employee efficiency and satisfaction, but also directly relates to the overall performance and market competitiveness of the enterprise[1]. However, traditional HRM methods are often limited to evaluation and management at the individual level, ignoring the complex interactions among employees and their potential impact on organizational behavior[2]. Therefore, exploring new management perspectives and methods to enhance the performance of human resource management has become an important direction of current research[3].

In recent years, Social Network Analysis (SNA) has been gaining attention in the field of organizational management because of its ability to reveal the structural characteristics and interaction patterns of relationships between individuals[4]. By quantifying the flow of information, collaborative relationships, and influence among employees, SNA helps to gain a deeper understanding of the roles of employees in an organization and their position in the group. Methods based on social network analysis can optimize human resource management at a higher level, enhance

the efficiency of collaboration and information sharing among employees, and thus promote overall performance improvement[5].

The purpose of this paper is to analyze the role of different network characteristics in performance management by constructing a social relationship network model within the enterprise, and to propose corresponding optimization strategies[6]. First, this paper will sort out the theoretical relationship between social relationship network analysis and human resource management performance, and then explore the influence mechanism of different relationship network structures on human resource performance through network model construction and key index analysis. Then, it will verify the application effect of network analysis in enterprise management through actual case studies, and finally, it will summarize the research conclusions and put forward the future development prospects.

2. The relationship between social network analysis and human resource management performance

Social Network Analysis (SNA) is an analytical method that studies individual relationships and interaction patterns from a holistic perspective, revealing the role of interpersonal relationships in an organization[7]. Unlike traditional human resource management methods, SNA emphasizes the strength of relationships, the degree of trust, and the fluidity of information among individuals, thus providing a more comprehensive picture of cooperation and competition within an organization[8]. This analysis can help business managers understand the position and role of employees in the organizational network, such as core employees, information transmitters, or knowledge-sharing bridges, thus providing a basis for improving overall performance. Degree Centrality Formula:

$$C_D(v) = \frac{k_v}{n-1} \tag{1}$$

Social networks play a key role in collaborative efficiency and knowledge sharing[9]. Employees in an organization do not work independently, but collaborate through a complex network of interactions. An efficient social network enhances the breadth and speed of information transfer, contributes to the rapid diffusion of knowledge, and thus improves the overall innovation and responsiveness of the team[10]. For example, in a tightly knit network structure, employees communicate frequently with each other and are able to solve problems and share experiences more quickly, a structure that helps to enhance the organization's collaborative efficiency and adaptability, showed in Figure 1:
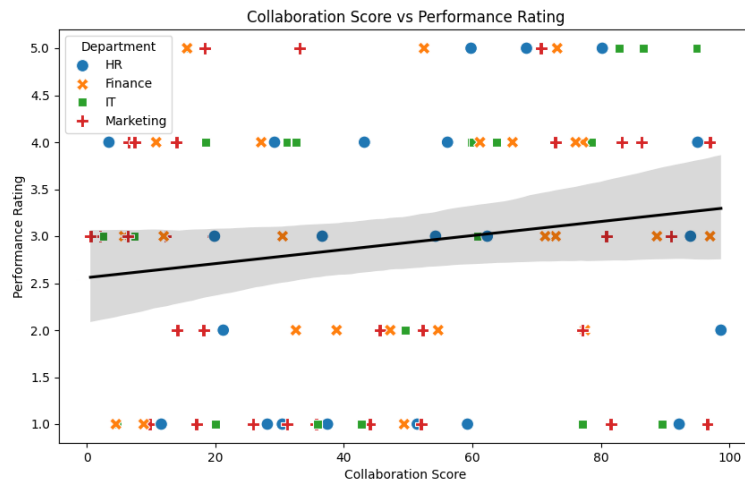

Figure 1: Collaboration Score vs Performance Rating

Key indicators such as centrality and structural holes in network analysis have a significant impact on HRM performance. Employees with high centrality usually have strong influence and resource dispatching ability, which can drive the motivation of surrounding employees and facilitate the effective flow of information. Structural Hole Theory suggests that some employees located in different groups can act as information bridges, connecting the information of various groups, thus improving the coordination and innovation of the whole organization. Therefore, identifying and developing these strategically placed employees through network analysis will help to improve the overall performance of the organization.

Social network analysis can also provide decision support in performance management and talent development. Based on the relationship data between employees, companies can identify high-performing core employees and potential leaders, and take targeted incentives and training measures. At the same time, social network analysis can reveal potential collaboration problems or information silos, providing a scientific basis for optimizing organizational structure, improving communication channels and adjusting staffing. Therefore, the application of social network analysis in human resource management can help enterprises to be more competitive in the ever-changing market environment.

3. Modeling Social Relationship Networks in Corporate Human Resource Management

In corporate human resource management, building effective social relationship network models is an important means of improving management performance. By building a model based on network analysis, it is possible to gain an in-depth understanding of the interactions, information flows, and influence distributions among employees, thereby identifying key nodes and connections that are critical to organizational performance. To achieve this goal, model construction involves steps such as basic theory support, data collection and network mapping, and selection of key network indicators, which lay the scientific basis for subsequent performance analysis and optimization strategy development.

3.1. Grounded theory for model construction

Modeling social networks within an enterprise requires the use of social network theory, which is the basic theory for analyzing the structure of relationships between individuals and groups. According to social network theory, individuals do not exist in isolation, but are connected to each other through various relationships, forming a complex network structure. This structure determines the flow path of information, the distribution of resources, and the transmission of influence. In enterprise human resource management, the use of social network theory can provide an in-depth understanding of the roles and interrelationships of employees in the network, and provide a reference for optimizing the allocation of human resources.

Structural hole theory plays an important role in the analysis of social networks. Structural holes theory suggests that individuals who act as "bridges" between different groups in a network connect different social groups and facilitate the transfer of information and resources. Employees in structural hole positions tend to have more cross-departmental or cross-team information and are able to exert greater influence in the organization. Therefore, by identifying key employees in structural holes when building network models, we can provide decision makers with effective suggestions for optimizing communication channels and resource allocation.

Social capital theory provides an alternative perspective for modeling relational networks. Social capital theory emphasizes that individuals are able to gain information, support, and resources through the relationships they establish and maintain with others, and that these relational networks are important intangible assets within organizations. In a corporate environment, the social capital

acquired by employees through their relationship networks often has a direct impact on their performance performance and career development. By analyzing the distribution of social capital in employee networks, managers can better design incentives and career development paths to enhance overall human resource management effectiveness.

Centrality theory is one of the key theories of network analysis and is used to measure the importance of individuals in a network. Employees with high centrality tend to occupy key positions in the network, have greater access to information and stronger influence. Centrality can be categorized into degree centrality, proximity centrality, and mediated centrality, each of which reflects a different role of the employee in the organization. For example, employees with high degree centrality are usually hubs of information, while employees with high mediating centrality play a bridging role in information flow. By applying the centrality theory in model construction, the core talents in the network can be identified and developed to support the improvement of organizational performance.

3.2. Data Collection and Network Mapping

Constructing a social relationship network model within an organization requires the collection of accurate relationship data, which usually includes the frequency of interaction, cooperation, and information sharing among employees. In the data collection stage, contact information between employees can be obtained through questionnaires, interviews, email records, project cooperation records, etc. Different data collection methods have their own advantages and disadvantages, for example, questionnaires can directly obtain subjective feedback from employees, while email records provide more objective relationship data, which is suitable for constructing real relationship networks. Betweenness Centrality Formula:

$$C_B(v) = \sum_{s \neq v \neq t} \frac{\sigma_{st}(v)}{\sigma_{st}} \tag{2}$$

During the process of relationship data collection, questionnaire design and data processing require special attention to ensure the validity and reliability of the data. The questionnaire design should try to refine the types of cooperative relationships, such as daily collaboration, resource support, knowledge sharing, etc., in order to distinguish the intensity of different types of relationships. Meanwhile, the data processing stage requires cleaning and standardization of the collected data to remove noise and inconsistent information to ensure the accuracy of the network model. This process can improve the science of network mapping construction and provide a high-quality data base for subsequent analysis.

Based on the collected data, the process of constructing network mapping is generally done using graphical software tools such as Gephi, UCINET, etc. Through these tools, employees can be regarded as network nodes and the relationships between them as connecting lines, thus generating a visualized network graph. The nodes and connecting lines in the graph not only can visualize the interaction structure among employees, but also can be further applied to subsequent network analysis, such as centrality calculation and structural hole identification. Therefore, the process of network mapping is not only a simple display of data, but also provides visual support for performance analysis and optimization strategies, showed in Figure 2:

Figure 2: Performance Rating Distribution by Department

After the network mapping is constructed, preliminary analysis and validation is an important step to ensure the accuracy of the data and the reliability of the mapping. Managers can confirm that the graph reasonably reflects the relationship structure within the organization by initially checking indicators such as the distribution of nodes and network density of the graph. For anomalous data or relationships, further validation and correction work may be necessary. This step helps to optimize the authenticity and validity of the network model, thus providing strong support for HRM decision-making.

3.3. Selection of key network indicators

Selection of appropriate key network metrics that quantify the structural characteristics of the network and reveal patterns of relationships among employees is a fundamental step in social network analysis. Commonly used network metrics include degree centrality, proximity centrality, median centrality, network density, and agglomeration coefficient. Through the analysis of these indicators, companies can better understand the role of each node (employee) in the network and its impact on the overall performance, providing data support for subsequent optimization strategy development.

Degree centrality is an important indicator of the importance of a node in a network, reflecting the number of direct connections of a node. In corporate human resource management, employees with high degree centrality are usually regarded as key disseminators of information, and they can effectively link other employees to facilitate information flow and knowledge sharing. Therefore, identifying these high degree centrality employees is important for enhancing teamwork efficiency and performance.

Dielectric centrality is used to assess the mediating role of a node in the flow of information, reflecting the node's role as a bridge between different sub-networks. Employees with high centrality play the role of connecting different groups in the information dissemination process, which can help organizations break down information silos and enhance cross-departmental collaboration. For enterprises, identifying and cultivating these employees with high centrality can effectively enhance the organization's innovation ability and flexibility in responding to changes.

Network density and cohesion are important indicators used to assess the characteristics of the overall network structure. Network density indicates the ratio of the number of actual connections to the number of possible connections in a network, reflecting the degree of communication and

cooperation within an organization; the coefficient of agglomeration measures the degree of closeness of relationships among employees, and a network with a high coefficient of agglomeration usually implies a strong relationship of trust among employees. By analyzing these two indicators, companies are able to identify teams with close relationships and further optimize their human resource management strategies to enhance the overall performance of the organization.

4. Performance Enhancement Strategies for Human Resource Management Based on Social Networks

Companies can improve HRM performance by optimizing communication channels. Based on social network analysis, managers are able to identify major nodes of information flow and potential communication bottlenecks. This enables companies to design more efficient communication strategies, for example, by encouraging high-social employees to act as message carriers or coordinators in teams, thus ensuring that important information is delivered quickly and effectively to the relevant employees. Regularly organizing cross-departmental meetings and team building activities can also enhance the connection between employees and promote information sharing and cooperation, thus improving overall work efficiency.

Enterprises should emphasize the construction of knowledge management and sharing mechanisms. Through social network analysis, managers can identify key people and resource nodes for knowledge transfer and develop personalized knowledge management strategies for these key employees. For example, an internal knowledge sharing platform can be established to encourage employees to share their experiences, best practices and innovative thinking, and to incentivize knowledge sharing behaviors through reward mechanisms. This not only enhances the knowledge level of employees, but also promotes collaboration and innovation among teams, creating greater value for the organization.

The development of HR training and development strategies should also be based on the results of social network analysis. Enterprises can identify high median employees with potential through network analysis and provide them with more training and development opportunities so that they can play a greater bridging role in the organization. In addition, companies can implement a mentorship system to encourage experienced employees to connect with new employees to accelerate knowledge transfer and cultural integration. By focusing on the development of employees in the network, companies can not only improve individual performance, but also enhance overall team cohesion and collaboration.

Enterprises should also regularly assess and provide feedback on the performance of human resource management to ensure continuous improvement. Through regular network analysis, managers can monitor changes in employee relations and fluctuations in performance indicators and make timely adjustments to management strategies and measures. At the same time, the establishment of an effective feedback mechanism that encourages employees to share their opinions and suggestions on HRM policies helps companies to continuously optimize their HRM practices. Through the implementation of these strategies, companies are able to improve their overall HRM performance and enhance their competitive advantage in the dynamically changing market environment.

5. Conclusion

Social network analysis provides a new perspective and methodology for the improvement of enterprise human resource management performance. Through in-depth analysis of the interaction between employees, enterprises can identify key nodes and potential communication bottlenecks, so as to adopt effective strategies in optimizing communication channels, strengthening knowledge

management, and formulating personalized training plans. These strategies not only enhance collaboration and trust among employees, but also improve the efficiency of information flow, creating greater value for the enterprise.

Through regular assessment and feedback, organizations are able to adjust their management strategies in a timely manner to adapt to the dynamically changing market environment. This process not only helps to improve the performance of individual employees, but also promotes the organization's innovation ability and competitive advantage in the whole world. In the future, with the continuous development of social network analysis technology, enterprises are bound to obtain richer theoretical support and practical guidance in the process of exploring new models of human resource management. Enterprises should actively use social network analysis tools to continuously optimize human resource management practices and promote the improvement of overall organizational performance. This is not only a deepening of the current human resource management theory, but also an important guarantee for enterprises to be invincible in the fierce market competition. Through the realization of scientific and systematic human resource management, enterprises will be able to better cope with future challenges and achieve sustainable development.

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