Research on Evaluation Mechanism of Innovation and Entrepreneurship Team Management Based on Data Mining Classification

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Abstract. In order to improve the quantitative performance appraisal mechanism in the existing innovation and Entrepreneurship Talent Management System, a research scheme based on data mining technology is proposed. The combination of decision tree algorithm and cluster analysis is applied to the quantitative performance appraisal system, so as to explore the relationship between the appraisal results and various factors. Kmeans clustering algorithm is used to evaluate and analyze the team members, which is roughly divided into four levels in the form of classification rules. According to the evaluation level and the core attributes of entrepreneurial team, the detailed final individual quantitative assessment score table is generated by using the decision tree algorithm. Taking the actual data of an entrepreneurial team as the sample to test, analyze and verify, the test results show that the proposed scheme has better accuracy, and provides strong decision support for talent team management.

Keywords: Data mining · Evaluation index · Performance evaluation · Quantitative performance · K-means clustering · Decision tree algorithm

1 Introduction

With the rapid development and large-scale popularization of computer technology, information collection and analysis has become a key problem in the development process of major enterprises and institutions. The 21st century has entered the era of big data. With the application of various computer-aided technologies such as office automation, information equipment and database software, massive data information has been produced. However, how to efficiently analyze and process these rapidly expanding data, and provide decision-making services and technical support for the business development of the Department, has become a difficult problem to be solved by the process supervision and control system, especially the innovation and entrepreneurship team management [1].

Data mining is an interdisciplinary subject that appeared in the 1990s, involving research results from database technology, knowledge engineering, probability and statistics, pattern recognition, neural network, visualization technology and other fields. The essential goal of data mining is to extract the hidden and valuable information and relationships from a large number of noisy, incomplete, fuzzy and random data. At present, the application of data mining in quantitative performance appraisal management system has become a hot research direction. Literature 5 proposes a human resource assessment system based on data mining. Literature 6] using the Apriori algorithm of data mining association rules to comprehensively analyze the students' scores, not only can we know the students' mastery of knowledge, but also can explore the internal relationship between courses. (7) data mining technology is applied to mine and integrate the information with potential value of enterprises and relevant information, so as to obtain more valuable information for evaluating enterprises and use project assessment to improve efficiency. Through the above research and analysis, it is found that the existing performance appraisal methods based on data mining all adopt single decision tree or association rule analysis, and the selection of member attributes involved in performance appraisal is not accurate [2].

Therefore, this paper proposes to apply decision tree algorithm and cluster analysis to quantitative performance appraisal system, in order to reveal the valuable information hidden behind the performance appraisal. Firstly, K-means clustering algorithm is used to evaluate and analyze the team members, which are roughly divided into four levels in the form of classification rules. Then, I3 decision tree algorithm is used to generate the final individual quantitative assessment score table according to the evaluation level and the core attributes of entrepreneurial team. Taking the actual data of an entrepreneurial team as the sample to test, analyze and verify, the test results show that the proposed scheme has good clustering accuracy and evaluation accuracy, which provides strong technical support for decision-making management and improves the work efficiency of innovation and entrepreneurship team management.

2　Data Mining Definition

Data mining brings together research results from machine learning, pattern recognition, database statistics, artificial intelligence and other fields. The large-scale popularization of computer produces massive data. Data mining processes and analyzes massive data by integrating the technical achievements of the above disciplines. Data mining is the key step of knowledge discovery process, as shown in Fig. 1.

A large amount of business information is digitized and key information is collected, preprocessed and transformed, as well as reasonable model selection, from which valuable hidden associated information can be extracted to assist management decision-making. Data mining can effectively improve business competitiveness and team operation efficiency. Through data mining technology, we can find two unrelated data, but at the same time, it is related to other third-party data, so as to indirectly establish a hidden connection through the network, so as to facilitate the transmission and analysis of information. The research goal of this paper is to build a quantitative performance evaluation mechanism of innovation and entrepreneurship team based on data mining
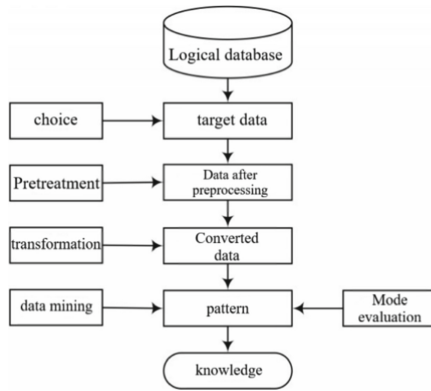
Fig. 1. Data mining knowledge discovery diagram

technology, so as to explore the relationship between the evaluation results and members' work-related factors.

3 Research on Quantitative Performance Appraisal Method Based on Data Mining

3.1 Analysis of Assessment Index

For the innovation and Entrepreneurship Talent Management System, the performance evaluation indicators are shown in Fig. 2, including achievement indicators, daily evaluation indicators and individual evaluation indicators [3].
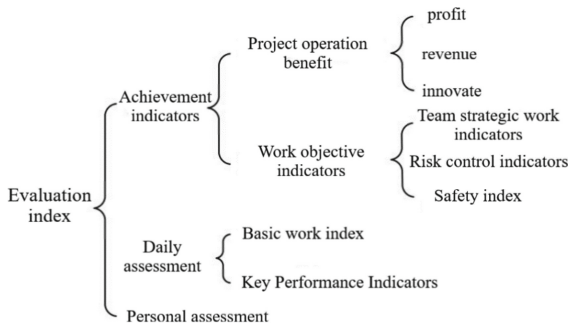

Fig. 2. Performance appraisal index system

3.2 Performance Appraisal Grade Evaluation Based on K-means Clustering

As a distance based partition clustering algorithm, K-means clustering algorithm has the advantages of simple structure, high efficiency and wide application range. K-means clustering algorithm is generally optimized by the objective function shown in Eq. (1):

$$E = \sum_{j=1}^{K} \sum_{x \in C_j} \|x - m_j\|^2 \qquad (1)$$

Where e is the clustering criterion function and K is the total number of clusters.

3.3 Quantitative Performance Evaluation Based on ID3 Decision Tree Algorithm

The key of ID3 decision tree algorithm is to calculate the information gain and entropy according to the idea of recursion. The initial entropy is calculated as follows:

$$S(I) = \sum_{i=1}^{c} \left(\frac{N_i}{N}\right) \log_2\left(\frac{N_i}{N}\right) \qquad (2)$$

In order to get more accurate evaluation results, seven core attributes are set in the performance appraisal database to build ID3 decision tree.

4 Test Results and Simulation Analysis

4.1 Test Configuration

The experimental hardware environment parameters are: Windows 7 operating system, CPU is i7 processor, 4GB memory. The test data comes from the actual historical data of an entrepreneurial team in recent two years. The team is divided into four project groups, with a total of 38 people.

4.2 Result Analysis

K-means clustering algorithm and I3 decision tree algorithm are used to calculate the performance evaluation scores of all members in a group [4].

The results show that the personal performance evaluation score is consistent with the actual personal performance evaluation results, and the accuracy of the data reaches 92%, which can meet the actual application needs in accuracy. In addition, through the data mining method, the efficiency of quantitative performance appraisal has been greatly improved, which has verified the advanced nature and effectiveness of the method [5].

We use 5000 students to simulate our algorithm, and the results show that with the increase of time, the quality and effect of teaching is also increasing, which also shows the effectiveness of our algorithm which is shown in Fig. 3.
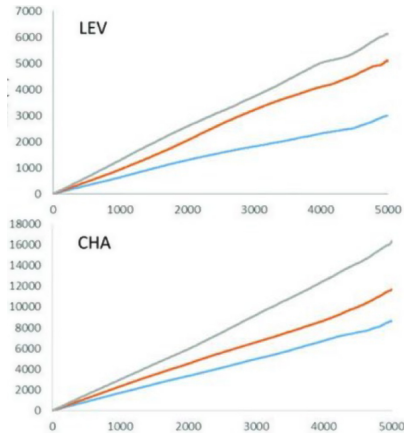
Fig. 3. Algorithm verification

5 Theoretical Basis and Concept Definition

5.1 The Theory of Team Building

Team building theory is generally divided into: cooperative competition theory, team member participation theory and constructive conflict theory [6]. In college students' innovation and entrepreneurship team, team members come from different family backgrounds and discipline backgrounds, and are good at different professional fields. According to the theory of cooperative competition, a team should have the team goals that the team members jointly identify. If a team does not have a common goal, the team members only consider their personal performance, which is easy to lead to the phenomenon of fighting separately, and they will ignore other team members. The team as a whole has no cohesion. When the team is in a competitive state, the team members try to maximize their own interests, Knowledge and resources will be blocked or even attacked and destroyed, resulting in poor team performance. Therefore, the team should first establish a common goal, and guide team members to work hard to achieve the common goal. Give full play to their own professional advantages, share the information and resources of the team, team members share their areas of expertise, cooperate with each other, and strive to get a higher level of performance. Team member participation theory can further stimulate the initiative and enthusiasm of team members by guiding team members to participate in and interact with decisions concerning their own interests. When team members participate in team decision-making and management, they will have a sense of team ownership. They are more likely to identify with the team goals set by their own participation, and they are more active in implementing decisions. The theory of construction conflict shows that team building should focus on the formation of cooperative relationship among team members. In the process of team project, team members may have different views on the same problem due to different backgrounds. Reasonable team conflict will make good preparation for the formation of high-quality decision. When the cooperative relationship is really formed, the team members will take the common goal of the team as the core, exchange views frankly, discuss valuable

elements, fully communicate and reach consensus. Therefore, through the treatment of constructive conflict, team members have more recognition of team goals, and the team relationship is more consolidated [7].

5.2 The Theory of Team Management

Team management theory is the concentrated embodiment of human thought in western management theory [8]. This theory is mainly based on the understanding of human nature. Since the beginning of the 20th century, there have been four major changes in the western organization management theory based on human nature: the hypothesis of "economic man", "social man", "self actualized man" and "complex man". The essence of team management is the process that team managers gather their team members together through management methods, establish common team goals, guide team members to cooperate with each other, make the original loose sand members form team cohesion and become an integral team, make full use of limited human resources, and produce much higher than individual work performance. The main viewpoints of team management theory are as follows: first, team members should have different professional backgrounds and play different roles in team activities to ensure the effective operation of team projects. Secondly, team leaders are influenced by many factors when they are in team management. Third, there are different types of team leadership. Fourth, the effective operation of the team needs to have interrelated conditions to maintain. Fifthly, the success of team work depends on the degree of social identity and social performance. Sixth, in the process of team management, the team leader should authorize the members to a certain extent. When members have the right to participate in decision-making, their sense of identity with team goals will be strengthened, and their decision-making execution will also be improved. Seventh, the respect between team leaders and members is the key to the success of team management. Eighth, cultivate the team's innovative spirit [9].

5.3 Group Psychology and Group Behavior Theory

People have the basic psychological needs of socialization. The members of College Students' innovation and entrepreneurship team form a group for various reasons, and have a common team goal. This goal enables members to gather together [10]. In the process of team cooperation, the overall performance is far higher than the performance level obtained by individual struggle, which not only realizes the team goal, but also realizes the goal pursued by individual. The team integrates all members, determines the common goal of the team through consultation, and guides the members to work hard for it, so as to generate team cohesion in the process of the team project, enhance the team awareness of the members, and make the team members work together and help each other to achieve the common goal; under the role of team cohesion, the team members fully communicate and exchange in the team activities, Enhance the harmonious relationship between team members, and create a good team atmosphere. Team atmosphere has a reverse effect on team cohesion, which helps to improve the overall work efficiency of the team, and further stimulates the enthusiasm and initiative

of team members in the process of activities, so as to promote the production of high team performance [11].

6 Research Conclusions and Suggestions

6.1 Members of Innovation and Entrepreneurship Team Lack Practical Experience, But They Have High Interest in Innovation and Entrepreneurship

When organizing the basic information of team members, it was found that more than half of the respondents in the college students' innovation and entrepreneurship competition had only one experience, while the number of participants three or more times was relatively rare. The statistical analysis of the reasons of the members shows that most of the participants participate in the competition with strong interest in innovation and entrepreneurship, and the situation of receiving the encouragement of the team members is relatively small. It can be seen that although college students lack practical experience, they are still enthusiastic about innovation and entrepreneurship [12].

We can find that colleges and universities provide support for college students' innovation and entrepreneurship team from different aspects, such as school publicity, instructors and team internal characteristics. In the connection of instructors, it is found that most of the teams have fixed instructors or innovation and entrepreneurship trainers; and most of these instructors have practical entrepreneurial experience, which can make up for the lack of team cooperation and actual entrepreneurial experience of college students to a large extent, So as to better improve the team performance of innovation and entrepreneurship team [13].

The effective improvement of College Students' innovation and entrepreneurship team performance can stimulate college students' entrepreneurial passion and improve their entrepreneurial willingness. The purpose of the university students' innovation and entrepreneurship competition is to stimulate the university students' innovation and entrepreneurship intention, so the team project audit is relatively loose in the early stage of the competition, and gradually strict in the later stage. According to the final score distribution of the team, 11.6%, 15.6%, 548%, 13.9% and 4.1% of the total team did not receive awards, department level, school level, provincial level and national level awards, respectively. Through the analysis of team performance and entrepreneurial intention, we can find that college students' innovation and entrepreneurship competition has a positive impact on College Students' entrepreneurial intention [14].

6.2 Countermeasures and Suggestions

This study analyzes the main factors affecting the performance of College Students' innovation and entrepreneurship team. In the actual management and construction tasks of the team, how to improve the performance of College Students' innovation and entrepreneurship team, so as to stimulate college students' entrepreneurial intention, is an important issue that university leaders, scientific research managers and team leaders must face. This section concludes the previous research work, and gives feasible and operational suggestions for the reference of the builders and managers of College Students' innovation and entrepreneurship team [15].

First of all, the team leader should make clear the motivation of the members to participate in the college students' innovation and entrepreneurship team. College Students' innovation and entrepreneurship team members are generally divided into three categories: the first type is interest oriented, with clear goals and strong execution, and will actively enrich the team's capital reserves from various aspects. The second is the competition utilitarian type, the participation of the team is only to obtain the corresponding credits, competition experience or awards. Although such members may not be interested in the direction of the team project, their strong purpose will bring efficient execution. The third type is the human persuasion type, which is generally because the team leader finds out and persuades the team leader to participate in the team without the intention of taking the initiative. Secondly, through the analysis of member information, the project tasks are arranged. Through communication with members, the team leader can collect as much information as possible, analyze the personal goals of members and the corresponding abilities required by the project. After mastering the above information, according to the principle of "differential treatment", targeted arrangements should be made to promote the integration of individual goals and team goals, so as to maximize the realization of project goals while ensuring the stability of members' participation in the project. Taking the interest oriented members as an example, the team should empower them to make their own team work plans and arrange their work, so that they can feel greater personal responsibility in the process of team work, stimulate their autonomy to participate in team work, encourage them to persist in research interest, and further cultivate the subjective consciousness and initiative consciousness of the interest oriented members. Finally, implement the evaluation and set the goal. In team work, specific and clear goals make team members have a stronger sense of commitment. Team members' commitment to goals will affect team performance. Therefore, the goal setting should be in line with the requirements of all parties involved in the process of achieving the team goal [16]. The clear division of the team goal is that the team members can timely understand the stages of the project, as well as the tasks of each stage and the standards to be achieved. This combination of specific team goals and project-oriented team norms can enhance the effectiveness of team members to complete team tasks and achieve team goals.

7   Conclusion

In this paper, the decision tree algorithm and cluster analysis are applied to the quantitative performance appraisal system. Firstly, K-means clustering algorithm is used to evaluate and analyze the team members, which are roughly divided into four levels in the form of classification rules. Then, ID3 decision tree algorithm is used to generate the final individual quantitative assessment score table according to the evaluation level and the core attributes of entrepreneurial team. The actual test results show that the proposed scheme has good clustering accuracy and evaluation accuracy, which has a certain reference significance for quantitative performance appraisal system.

Limitations of research tools. This study was conducted from different levels. In addition to the basic information, the addition of the three scales results in a long questionnaire, which makes the subjects feel tired and affects the quality of the test. In order

to reduce the number of invalid questionnaires, I use the paper version of all the questionnaires, and send them to each team one by one, and explain the reasons with the subjects, and ask them to fill in carefully. This is of great help to the quality of questionnaire filling, but it still can not avoid the phenomenon that individual subjects do not want to do or give up halfway, which has a certain impact on the recovery rate and efficiency of the questionnaire. In the future questionnaire design, we should pay more attention to the time and patience of the subjects, and reduce the number of questions without affecting the test results. In terms of research methods, due to objective reasons, some members of the team are not convenient to interview, and privacy issues may also cause resistance. The lack of guidance in the interview and the lack of in-depth analysis lead to defects in research methods.

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