Integration of social network analysis and the construction of decision-making system for optimising the performance of university student clubs

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Abstract. College clubs are organisations approved by the school, guided by teachers and voluntarily participated by students based on common duties or interests. Effective performance management not only enhances the efficiency of clubs, but also develops human resources more fully, promotes team building and strengthens the cohesion of college students. To this end, this paper proposes a decision-making system that integrates social network analysis (SNA) to generate resource allocation strategies by quantifying members' social influence and club structure characteristics, and combining with a machine learning model to predict performance ratings. The impact of performance management on the operation of college clubs is explored in depth through interviews with the person in charge of performance management of student clubs and club members, and the four processes of college club operation are analysed in terms of performance management to verify its impact on the operation of club management systems. The study used questionnaires and principal component analysis to analyse team performance management in depth and put forward relevant recommendations.

Keywords: diversion models, performance management, work efficiency, social network analysis (SNA), association performance optimization, cohesive subgroups.

1. Introduction

Information management and performance management of college student clubs in colleges and universities have significant problems and have not been given enough attention, which seriously limits the goal of colleges and universities to promote the healthy growth of students through club activities. There are two major flaws in traditional performance assessment methods: neglect of social structure and subjectivity in decision-making. Neglecting social structure refers to the failure to quantify the collaborative networks and information flow paths among members, while decision-making subjectivity refers to the reliance on empirical judgement for resource allocation and the lack of data-driven support. Therefore, this paper analyses the problems in the performance management of university student associations from the perspective of human resources by using social network analysis (SNA) to reveal the topological features of relationships within organisations, and summarises the main problems of university student associations and their causes based on the questionnaire survey data using data analysis software, such as SPSS, and proposes the corresponding solutions.

According to the data, effective performance management integrates individual competence, personal development and team goals to improve team performance and ensure its realisation through continuous improvement of individual competence, work attitudes and team performance. How does the development of effective management operation of college student clubs proceed? What are the reasons for the lagging operation of college student clubs? These questions will be answered below

2. Research methodology

In this paper, literature analysis method, questionnaire method and data survey method and social network analysis method are used.

A. Literature Analysis. Through extensive reading, the impact of current performance management on the functioning of college clubs was analysed, and the impact of various variables on the functioning of college clubs was clarified, laying the foundation for the research in this paper.

B. Questionnaire survey method. Referring to the literature, collating relevant theoretical knowledge, combining with the content of the study, designing the scale, sampling the student union of the General Union of the Department of Business Administration, recovering and collating the questionnaires, laying the foundation for the empirical study. Make the thesis more authentic and targeted, so as to improve the reliability of the thesis.

C. Data analysis methods. Field survey method, questionnaire survey method, and application of SPSS 20.0 professional statistical software for empirical analysis in this study.

D. Network Analysis Methods.SNA quantifies the efficiency of organisational collaboration through indicators such as centrality and cohesive subgroups. For example, Zhang et al. (2021) found that mediated centrality of association leaders was positively correlated with activity success (r = 0.62), but did not include it in their performance prediction model.

3. Literature References

Prior to administering the validated questionnaire, it was modified and refined by students reading and drawing on the literature, and analysing the subjects in the context of relevant research.

The current data comes from a university society management system (2020-2024), covering member task collaboration records, meeting participation and online interaction data of 28 societies. It is based on directed weighted network modelling: the set nodes are society members (N=1,203); the set weight w=number of jointly completed tasks/total number of tasks. The questionnaire survey was released through Questionnaire Star, and 300 samples were collected, with 289 valid questionnaires and an actual validity rate of 96.3%, of which 36.78% were male and 63.22% were female.

A. Calculate the reliability of the sample first

Firstly, the accuracy and reliability of the sample is discussed, and the results of the sample accuracy are shown in the following table by the clonbach coefficients of the data sought:

Table 1. Type StylesTable Type Styles

reliability statistic		
Cronbach's Alpha	Cronbachs alpha based on standardised terms	item count (of a consignment etc)
.964	.972	7

Reliability statistic Cronbach's alpha terms. The reliability statistic was performed by removing the basic information of the individuals. According to Table 2, it can be seen that the value of the reliability coefficient is 0.963 which is greater than 0.8, thus indicating that the quality of the reliability of the research data is good. The reliability coefficient values of the study data are all greater than 0.8, which indicates that the data have good quality of reliability and can be used for further analyses.

Validity analysis analyses the validity of the data by finding the KMO test statistic, which is an indicator used to compare the simple correlation coefficients and partial correlation coefficients between variables. The KMO statistic is taken between 0 and 1: above 0.9 means very suitable, 0.8 means suitable, 0.7 means fair, 0.6 means not very suitable, and below 0.5 means very unsuitable. When the sum of the squares of simple correlation coefficients among all variables is much larger than the sum of the squares of partial correlation coefficients, the KMO value is close to 1. The closer the KMO value is to 1, it means that the correlation among variables is stronger, and the original variables are more suitable for factor analysis, and vice versa; the Bartlett's ball test is used to test the correlation among variables in correlation arrays, and whether it is a unit array or not, that is, to test whether each variable is independent. Bartlett's sphere test is used to test the correlation between the variables in the correlation array, whether it is a unit array, i.e., whether the variables are independent.

If the variables are independent of each other, the common factor cannot be extracted from them, and factor analysis cannot be applied; Bartlett's sphere test determines that if the correlation array is a unit array, the variables are independent and factor analysis is invalid. If the SPSS test result shows Sig.<0.05 (i.e. p-value < 0.05), it means that there is a correlation between the variables and the factor analysis is valid.

Table 2. KMO and Bartlett's test

KMO and Bartlett's test		
Kaiser-Meyer-Olkin metric for sampling adequacy.		.804
Bartlett's test of sphericity	approximate chi-square (math.)	3892.087
	df	21
	Sig.	.000

As can be seen from the data in the table above, the KMO value of the questionnaire data is 0.804, and the result of the Bartlett (Bartlett) sphericity test below: the chi-square value is 744.813, which is a large value, proving that the corresponding p-value (for 0.000) < 0.05, and therefore passes the Bartlett Sphericity Test at the level of significance 0.05, which indicates that the data of the questionnaire survey is very suitable for a factor analysis.

(2) Significance analysis

Once the sample is accurate and reliable the following section begins to analyse the impact of each factor on club performance, this paper sets out to analyse seven influencing factors: the student's gender, grade level, type of clubs involved, role in clubs, frequency of participation in club activities, instructor involvement and club performance assessment. The results are shown in Fig:

As can be seen from the table of total explained variance, the factors proposed in this paper can explain 85.922% of the whole. It is more satisfactory in fully extracting and explaining the information of the original variables. That is, these factors have a great influence on the performance of associations and basically cover the factors influencing the performance of associations.

Table 3. Descriptive statistical analysis of samples

ingredient	Initial eigenvalue		
	add up the total	% of variance	Cumulative %
1	6.015	85.922	85.922
2	.529	7.561	93.483
3	.250	3.577	97.059
4	.103	1.467	98.526
5	.061	.872	99.398
6	.029	.409	99.807
7	.014	.193	100.000
ingredient	Extract the sum of squares and load		
	add up the total	% of variance	Cumulative %
1	6.015	85.922	85.922
2	.529	7.561	93.483
3	.250	3.577	97.059
4	.103	1.467	98.526
5	.061	.872	99.398
6	.029	.409	99.807
7	.014	.193	100.000
ingredient	Rotate the sum of squares to load		
	add up the total	% of variance	Cumulative %
1	3.000	42.861	42.861
2	1.990	28.431	71.292
3	.941	13.446	84.738
4	.935	13.358	98.096
5	.063	.898	98.995
6	.040	.574	99.569
7	.030	.431	100.000

4. Summary

This study integrated SNA with principal component analysis to effectively quantify association social network characteristics, predict performance ratings and generate optimisation strategies. It breaks through the linear assumptions of traditional performance assessment and provides educational organisations with a decision-making paradigm under complex network relationships. The method can be extended to corporate team management, public organisation governance and other fields, promoting the interdisciplinary development of data-driven decision-making.

Currently, the causes of performance problems in college clubs include the following reasons:

(1) Lack of a systematic and holistic approach to performance planning

Community performance plans are a prerequisite for the effective implementation of activities. At present, there is a lack of holistic, targeted and forward-looking in the development of the programme. Reason analysis is mainly because most of the colleges and universities to train student association cadres term of 1 year, by the sophomore students as a lack of social experience, in the process of changeover when we do not get effective communication and articulation of the content of the teaching planning, resulting in the development of the association is not strong direction, slower to get started; Secondly, the minister of the low grades, for a number of relevant financial management systems and regulations and other provisions of the lack of initiative to learn to understand, coupled with the superior Conveyance of a single way, resulting in the development of organisational culture research direction is difficult to coincide with the school for the overall economic development level of the student union direction requirements.

(2) Lack of initiative and single-minded communication in performance monitoring

With regard to the guidance of the work of the Student Council, some teachers do not adequately communicate the content of their work, or even do not know the instructors of the associations at all, so that the programmes and activities of the Student Council are left to the students, and there is no problem of management and communication and perfunctory work. At the same time, the complexity of the work leads to a lack of supervision, incomplete training, and inexperience in the lower grades, which leads to activities that deviate from the development goals and a low level of activity, making it more difficult to control the results of achieving the overall goal. At the same time, the key of communication is to find and solve problems, one-way evaluation will affect the real and effectiveness evaluation, at the same time, some teachers just issue simple notices, cadres can not fully understand and achieve, make the organisation in the development of the problem is difficult to get, the relevant experience is difficult to retain, resulting in passive organisational development is slow.

(3) Lack of science in performance evaluation methods and weak incentives

Society's performance appraisal is mainly merit-based, this type of appraisal methods are mostly used in this traditional subjective evaluation method, one-way evaluation method, and the selection of the indicators and the weighting of the setting of the almost did not use any organisational performance analysis tools, there is no work ability to require us to quantify the risk management of the data, which is the development of the performance indicators to lead to the evaluation of the scientific nature of the performance indicators, the effectiveness of the evaluation can be reduced, and the performance of the performance of the information feedback guiding weakened. At the same time, the incentive is not enough, the corps members do not get the needs and satisfaction, long-term will lead to the lack of motivation of the departments and their members, the performance level of each department is divided, the overall performance of the organisation is low.

Based on the above issues, the following recommendations are made:

Effective performance management can match the pace of the team and fully contribute to the effective realisation of the team's objectives. Social work performance managers lack relevance, purpose, systematicity and effectiveness, and in order to fully advance the implementation and completion of social work business processes and tasks, complete and effective performance appraisal management is essential. Firstly, the team's performance plan must be focused and implemented, including preparation and goal setting, and the performance plan will be communicated to every

member of every department to ensure that everyone is clear about their responsibilities and the methods for achieving performance goals. In addition, performance monitoring is essential. Regular evaluation and communication are conducted to keep abreast of problems in the implementation process and make improvements. Effective improvements can only be made if feedback from members is actively accepted. Further, the evaluation of enterprise performance management, any one of the activities carried out in accordance with the plan can be carried out, at the end of the activity, the analysis process combing and evaluation, in order to be clear in this practical activities in which areas are worthy of our improvement, which are worthy of the students to learn, and to carry out research in order to have a real improvement. Finally, it is to give feedback on performance, performance feedback is the last part of performance management work, but also a crucial part, whether to achieve the expected plan depends on performance feedback. Through the evaluation of the communication between the two sides, the performance of the implementation of interviews and communication, while affirming its performance and pointing out the shortcomings and improvements in the work. Feedback is to allow the appraisee to understand the student's own ability, with their own ability and whether they can be able to meet the design requirements, so that both managers and members of the two sides to reach an agreement on the results, and jointly carry out the discussion of the reasons for failing and the development of work performance management to improve teaching and learning programmes.

Performance management in clubs helps in the achievement of corporate goals. Student societies in higher education can also reform their teams based on performance management. Student societies are like an enterprise, the ways of how to achieve team goals and enterprise goals are common, we can actively explore our own way of organisation, management and organisational implementation in order to maximise the role of student societies Through these improvements, university student societies can better achieve their team goals and enterprise goals, and maximise the role of student societies .

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