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Performance Assessment and Practical Exploration of School-Enterprise Integration of Higher Vocational Hospitality Management Majors Based on Fuzzy Comprehensive Evaluation Model

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Abstract Higher vocational hotel management profession has strong applicability characteristics and high requirements for comprehensive ability of talents. At present, the practical training conditions of most institutions cannot meet the needs of real hotels, resulting in the gap between students' abilities and enterprises' demands. Although the prospect of school-enterprise integration is promising, the cooperation is often superficial due to the differences in the values of both sides and the lack of performance evaluation mechanism. In this study, an evaluation index system based on the CIPP model is constructed to assess the performance of school-enterprise integration in higher vocational hotel management majors. The study applies the rooting theory to code and analyze 200 pieces of literature to form 4 first-level indicators and 16 second-level indicators, adopts the hierarchical analysis method to determine the weights of the indicators, in which the input evaluation has the highest weight (0.3377) and the background evaluation is the second highest (0.3224), applies the fuzzy comprehensive evaluation method to carry out empirical analysis on a higher vocational hospitality management major, and the comprehensive evaluation score is 86.91 points. The study further used the fsQCA method to identify four grouped paths to achieve high performance, with an overall coverage of 0.796. The results showed that: building a dual-teacher team (weight 0.3181) and the degree of perfection of the cooperation mechanism (weight 0.1352) were the key factors affecting the performance of school-enterprise integration, the path with the participation of a large enterprise and a perfect project implementation process had the highest coverage (0.488). This study provides a systematic evaluation tool and improvement path for school-enterprise integration in higher vocational hotel management program.

Index Terms Higher vocational education, hospitality management, school-enterprise integration, fuzzy comprehensive evaluation, CIPP model, performance assessment

I. Introduction

The hotel management profession is highly applied, with high requirements for the comprehensive ability and professionalism of talents, and the cultivation of these abilities and qualities need to be supported by perfect practical training equipment as well as a real and changing working environment. However, the current on-campus practical training conditions and environment of hotel management majors in most colleges and universities are unable to meet the work requirements of real hotels, resulting in students' graduation internships and employment away from the needs of enterprises and a certain distance [1]. In view of this situation, combined with the current deepening of the school-enterprise cooperation background, the hotel management professional teaching mode reform and innovation [2]. School-enterprise integration has unlimited bright prospects, but there are still many resistances. The rapid development of the lodging industry, the extensive application of multi-industry, big data, artificial intelligence technology makes the enterprise's requirements for talents higher and higher, the curriculum and standards are still based on the industry development and standards of a few years ago or even a dozen years ago, while education itself has a lagging effect, the school's talent cultivation program is out of touch with the real needs of the society [3]-[6]. The school-enterprise cooperation in many schools still floats on the surface, although both sides can agree on educating students together, but because of the different values of the two sides, the school educates people, the enterprise makes profits, and the school-enterprise resource exchange is seriously mismatched, resulting in this new teaching mode that can benefit the society has always been difficult to be truly popularized [7]-[9]. The root of this phenomenon lies in the lack of performance evaluation and practice mechanism of school-enterprise cooperation.

Hierarchical analysis method and other methods are commonly used in the evaluation of school-enterprise integration, to a certain extent, the evaluation is effective, but facing the poor ability to deal with the vagueness of the evaluation indexes, the weight distribution of the evaluation indexes before the irrationality of the indicators, less than one-third of the indicators related to the enterprise, due to the hospitality management profession of the enterprise practice presents cyclical changes, but the fluctuation of the evaluation of the lack of [10], [11]. And the fuzzy comprehensive evaluation method is a comprehensive evaluation method based on fuzzy mathematics, which applies the principle of fuzzy relationship synthesis to quantify some unclear boundaries and difficult to quantify factors for comprehensive evaluation [12]. This method provides a solution to the above problems.

As an application-oriented discipline, hotel management major requires students' practical ability and professionalism, and the cultivation of these abilities needs to be supported by perfect practical training facilities and real working environment. However, at present, hotel management majors in higher vocational colleges and universities generally face the dilemma of disconnecting the practical training conditions from the real working environment, which leads to an obvious gap between the actual ability of graduates and the needs of enterprises. In the context of deepening school-enterprise cooperation, industry-teaching integration has become an important way to solve this problem. Although school-enterprise integration has great potential, it still faces many obstacles in the actual promotion process. The rapid development of lodging industry, multi-industry integration and digital transformation have put forward higher requirements for talent cultivation, while the lagging nature of the education system makes it difficult for talent cultivation programs to timely connect with industrial demand. More critically, the difference in value orientation between school education and enterprise profitability has led to a serious imbalance in the exchange of resources, and many school-enterprise cooperation programs remain on the surface, making it difficult to promote in-depth. The root of this phenomenon lies in the lack of a scientific performance evaluation system and practice mechanism for school-enterprise integration. Traditional evaluation methods such as hierarchical analysis have limitations in dealing with fuzzy indicators and dynamic changes, especially the insufficient coverage of enterprise-related indicators, which cannot effectively reflect the cyclical characteristics of the hotel industry. As a comprehensive evaluation method based on fuzzy mathematics, the fuzzy comprehensive evaluation method is able to transform factors that are difficult to quantify into quantitative analysis, which provides a new way of thinking to solve the above problems. Based on this background, this study applies the Zagan theory to construct the evaluation index system, uses the CIPP model to reconstruct the indexes, applies the hierarchical analysis method to determine the weights, and conducts an empirical analysis through the fuzzy comprehensive evaluation method. The study also introduces the fsQCA method to explore the effective path of school-enterprise integration for higher vocational hotel management majors from the perspective of conditional grouping, providing theoretical support and practical guidance for improving the quality of industry-teaching integration. Through systematic theoretical analysis and empirical research, this study is committed to constructing a set of scientific and comprehensive performance evaluation system for school-enterprise integration, and identifying the key factors and optimization paths that affect the effectiveness of cooperation.

II. Construction of Performance Evaluation Indicator System for School-Enterprise Integration of Higher Education Hotel Management Majors

II. A. Application of rootedness theory for the initial selection of indicators

Rooted theory is one of the traditional qualitative research methods, which is used to summarize and summarize the original data layer by layer, gradually extract the key information, and then construct the theoretical model. In this study, through organizing and categorizing the public literature related to the school-enterprise integration of higher vocational hotel management majors and the internal data of school-enterprise integration of higher vocational hotel management majors in typical development zones at home and abroad, a total of 200 pieces of core literature that are highly compatible with the research topic have been obtained. Nvivo 11 software was used for open coding, spindle coding and selective coding. In the open coding, a combination of automatic coding and manual coding was used to extract and summarize the original data, forming 4,255 coding reference points, 226 concepts and 38 basic categories, which were then integrated into 7 main categories through cluster analysis, and a framework for the initial selection of indicators was formed by applying the rooting theory.

II. B. Determination of the evaluation indicator framework based on the CIPP model

II. B. 1) CIPP evaluation model and its relevance

The CIPP evaluation model includes four stages of evaluation: background, input, process and result. Unlike the target evaluation model, this evaluation model is a decision-making and process-oriented educational evaluation model, which aims at diagnosis and improvement rather than verification.The application of CIPP model to the evaluation of school-enterprise integration performance of higher vocational hospitality management majors emphasizes more on the whole process and circularity, which is more appropriate [13]. Based on the CIPP model, the performance evaluation of school-enterprise integration of higher vocational hotel management majors is a cyclic process, which provides dynamic and accurate information for scientific decision-making through constant feedback and continuous improvement on this basis.

II. B. 2) Application of the CIPP model to reconfigure the indicator framework

Applying the CIPP model, the preliminary indicators obtained through the rooting theory were reconstructed according to four dimensions: background, input, process and result. In order to ensure the objectivity and scientificity of the study, four people each, including teachers of higher vocational colleges and universities, administrators, enterprise experts involved in the integration of industry and education and representatives of industry organizations, were selected to carry out the rationality consultation by using the Delphi consulting method, and the indicators were further screened according to the four phases of background, input, process and result, and finally formed the evaluation indicator system [14]. The evaluation index framework of school-enterprise integration performance of higher vocational hotel management majors based on CIPP model is shown in Table 1.

Table 1: Evaluation index system

Primary indicator	Secondary indicator
Background evaluation (C)	Meet industrial demand (C1)
	Characteristics of running schools (C2)
	The production and education integration was included in the plan (C3)
	Cooperation mechanism perfection (C4)
Input evaluation (I)	Investment in cooperation (I1)
	Building platform carrier (I2)
	Build a team of teachers (I3)
	Establishment of cooperative management institutions (I4)
Process evaluation (P1)	School enterprises build major (P11)
	Campus enterprise building course (P12)
	Technological innovation and results transformation (P13)
	Social services (P14)
Result evaluation (P2)	Talent cultivation results (P21)
	Professional construction achievements (P22)
	Economic service benefit (P23)
	Social service benefits (P24)

II. C. Determination of indicator weights by hierarchical analysis method (AHP)

Hierarchical analysis method can decompose the complex problem into multiple levels and factors, and through the comparison of the two combinations of indicators, weights are assigned to each level, which results in the order of importance of the factors in different levels, thus providing support for decision-making. The specific application steps for determining the weights of the hierarchical analysis method are as follows:

(1) Establishment of hierarchical structure model

By dividing the indicators to be evaluated into different levels according to their interrelationships, a hierarchical model is formed, which can usually be divided into three levels: the target level, the criterion level and the program level, and the hierarchical model is shown in Fig. 1. Among them, the goal level is the highest level and contains only one element, which refers to the predetermined goal of decision-making and the problem to be solved. The criterion layer is the middle level, which refers to the decision-making criteria and other elements that are taken into account to achieve the goal, and consists of multiple indicators. The solution level is the lowest level and is intended to provide options for achieving the decision goal. There is a linear affiliation between these three levels [15].

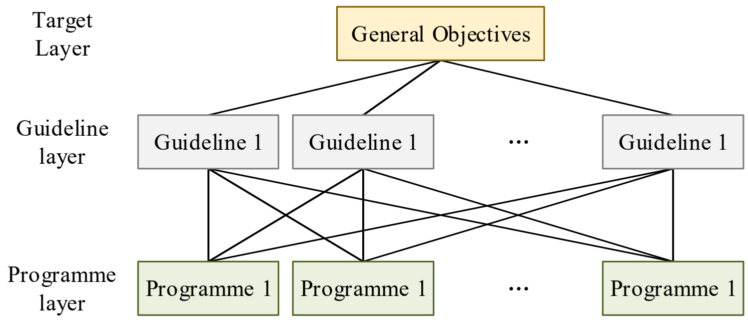

Figure :1 Hierarchical model

(2) Constructing a two-by-two judgment matrix

In this paper, pairwise comparisons between indicators are made to determine the weights of each indicator by using the 1-9 scale, a method that allows for a quantitative assessment of the relative importance between factors.

Constructing a judgment matrix can reflect the relative importance between factors, an example of which is:

$$A=\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{21} & \cdots & a_{2j} \\ \vdots & \vdots & \vdots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} \end{bmatrix}=A(a_{ij}) \tag{1}$$

where $a_{ij}>0$, $a_{ij}=1/a_{ji}(i\neq j)$, and $a_{ij}=1\left(i=j\ And\ i,j=1,2,\cdots n\right)$.

(3) Calculate the weight vector

The weight vector is obtained from the eigenvectors corresponding to the largest eigenroot of the judgment matrix and is obtained by normalization. The key to this step is to convert the original pairwise comparison result into the actual weight value, the specific steps are as follows:

1) Find the weight vector W by the square root value method, i.e.:

$$w_i'=\sqrt[n]{\prod_{j=1}^{n}a_{ij}},i=1,2,\cdots,n \tag{2}$$

2) By normalization, the weight value of indicator i can be obtained as:

$$w_{ji}=\frac{w_i'}{\sum_{j=1}^{n}w_i'},i=1,2,\cdots,n \tag{3}$$

This yields a weight vector of indicators as $W=\left(w_1,w_2,\cdots,w_n\right)$, where $\sum_{i=1}^{n}w_i=1$.

3) Derive the maximum eigenvalue of the judgment matrix $\lambda_{\max}$:

$$AW=\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{21} & \cdots & a_{2j} \\ \vdots & \vdots & \vdots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} \end{bmatrix}\begin{bmatrix} w_1 \\ w_2 \\ \vdots \\ w_j \end{bmatrix} \tag{4}$$

$$\lambda_{\max}=\frac{1}{n}\sum_{i=1}^{2}\frac{\left(AW\right)_i}{w_i} \tag{5}$$

where n is the number of rows of the judgment matrix.

(4) Consistency test

Consistency test can ensure the reliability of the judgment matrix, the main criterion is to test whether the coefficient meets less than 0.1, to determine whether the matrix is a consistency matrix, you need to first calculate the consistency index CI based on the maximum eigenvalue of the judgment matrix and the number of indicators of the dimensions of judgment:

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{6}$$

The test coefficient CR is the final judgment criterion, the consistency index CI is compared with the average random consistency index RI sample mean to derive the test coefficient CR [16]. When $CR < 0.1$, then the judgment matrix can be judged to pass the consistency test c Conversely, the consistency test is not satisfied, and it is necessary to replace the elements in the judgment matrix until the consistency test is passed, and the formula for calculating the consistency ratio is:

$$CR = \frac{CI}{RI} \tag{7}$$

II. D.Evaluation modeling

The fuzzy synthesis evaluation method is a method based on the principles of fuzzy mathematics for solving complex problems combining qualitative and quantitative analysis. By applying the principle of fuzzy relationship synthesis in fuzzy mathematics to the evaluation analysis, it can effectively deal with the evaluation problems of strong uncertainty of evaluation indexes and difficulty in precise quantification. The core of the fuzzy comprehensive evaluation method lies in the construction of the fuzzy relationship matrix, which transforms the qualitative evaluation into quantitative analysis, so as to arrive at the comprehensive evaluation results. The basic steps of the fuzzy comprehensive evaluation method are as follows:

(1) Establish the factor set

Establish the factor set according to the benefit evaluation index system.

$$U = \{U_1, U_2, \cdots, U_n\} \tag{8}$$

(2) Establish the target weight allocation set W based on the results of the comprehensive weight calculation

$$W = \{W_1, W_2, \cdots, W_n\} \tag{9}$$

and satisfy the conditions $0 < W_i \le 1$, $\sum_{i=1}^{n} W_i = 1$, $(i = 1, 2, \cdots, n)$.

(3) Construct evaluation sets

Set evaluation levels or evaluation sets, which are used to describe the extent to which the subject of evaluation has reached each level.

$$V = \{V_1, V_2, \cdots, V_m\} \tag{10}$$

The rubrics are the criteria used by the experts to score the effectiveness indicators. The general evaluation of each indicator can be evaluated using a five-level scale method, consisting of five rubrics to form a rubric set, expressed as {excellent, good, medium, poor, poor}.

In order to facilitate the comparison of the same level of each evaluation object, this paper sets the corresponding score standard. The correspondence between evaluation level and score is shown in Table 2.

Table 2: Raw data of each indicator

Evaluation grade	Excellence	Good	Medium	Worse	Bad
Scoring interval	[100~90]	(90~80]	(80~70]	(70~60]	(60~0]

(4) Establishment of fuzzy evaluation matrix

Determine the fuzzy relationship matrix R. Conduct a single-factor evaluation between the set of evaluation object factors U and the set of rating criteria V to establish a fuzzy relationship matrix:

$$R=\begin{pmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nn} \end{pmatrix} \tag{11}$$

where, the element r_{ij} denotes the degree of affiliation of the i th factor u_i in the set of evaluation object factors U corresponding to the j th grade v_j in the set of evaluation criteria grades V.

(5) Synthesize the fuzzy comprehensive evaluation result vector

Synthesize the fuzzy judgment matrix with the weight set to get the fuzzy evaluation result vector A:

$$\begin{aligned} A = W \cdot R = \left[w_1, w_2 \cdots w_n\right] \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{pmatrix} \\ = \left[a_1, a_2 \cdots a_n\right] \end{aligned} \tag{12}$$

(6) Determination of total evaluation results

Calculate the weighted average of the evaluation result vector A and the values corresponding to different grades F to get the score S of each performance evaluation index:

$$S = A \cdot F \tag{13}$$

III. Performance Evaluation of School-Enterprise Integration for Higher Education Hotel Management Programs

This section of the experiment launched an empirical study on the hotel management program of a higher vocational school. Twenty-six experts were invited to evaluate the school-enterprise integration performance of the hospitality management program of the university, which was subsequently calculated and analyzed using the AHP-fuzzy comprehensive evaluation method.

III. A. Summary of results for indicator weights

The relative weights of the indicators in the indicator layer are calculated. The relative weights are multiplied step by step to get the comprehensive weight, i.e., the hierarchical ordering of the lowest level indicators to the total objective. The weights of the indicators of school-enterprise integration performance evaluation for higher vocational hotel management majors are shown in Table 3. As can be seen from the table, the relative weight index of input evaluation (I) is the highest, which indicates that investing in cooperation funds, building platform carriers, constructing dual-teacher teams and setting up cooperative management organizations play a more important role in school-enterprise integration of higher vocational hotel management majors.

The weight vectors for the primary and secondary indicator layers can be determined, respectively:

$W = (0.3224, 0.3377, 0.1973, 0.1426)$
$W_1 = (0.1905, 0.2402, 0.3862, 0.1831)$
$W_2 = (0.1892, 0.2139, 0.3181, 0.2788)$
$W_3 = (0.2041, 0.3194, 0.2986, 0.1779)$
$W_4 = (0.2963, 0.2935, 0.2847, 0.1255)$

III. B. Comprehensive evaluation

III. B. 1) Integration of questionnaire statistics

Based on the data collected from the questionnaire survey, we counted and consolidated the rubrics for each evaluation indicator. The ratio of the frequency of different levels of evaluation indicators to the total number of evaluation indicators constitutes the score of the evaluation indicator. Through the scores of program-level indicators, we can construct the evaluation matrix of guideline-level indicators, and so on, as shown below:

According to the evaluation data of internal control indexes of University H obtained from the questionnaire survey, the performance evaluation of school-enterprise integration of higher vocational hotel management program is shown in Table 4.

Table 3: Aggregate weight summary

Primary indicator	Relative weight	Secondary indicator	Relative weight	Composite weight
C	0.3224	C1	0.1905	0.0922
		C2	0.2402	0.1263
		C3	0.3862	0.0955
		C4	0.1831	0.1352
I	0.3377	I1	0.1892	0.052
		I2	0.2139	0.1026
		I3	0.3181	0.0396
		I4	0.2788	0.0618
P1	0.1973	P11	0.2041	0.0562
		P12	0.3194	0.0182
		P13	0.2986	0.0512
		P14	0.1779	0.065
P2	0.1426	P21	0.2963	0.0345
		P22	0.2935	0.0312
		P23	0.2847	0.0239
		P24	0.1255	0.0146

Table 4: Performance evaluation

Primary indicator	Secondary indicator	Excellence	Good	Medium	Worse	Bad
C	C1	5	10	10	1	0
	C2	7	6	9	3	1
	C3	5	2	16	3	0
	C4	4	7	11	4	0
I	I1	13	12	1	0	0
	I2	7	11	8	0	0
	I3	3	7	12	4	0
	I4	9	9	5	3	0
P1	P11	9	7	10	0	0
	P12	6	10	8	1	1
	P13	14	8	4	0	0
	P14	8	11	7	0	0
P2	P21	10	13	0	3	0
	P22	12	11	3	0	0
	P23	13	4	7	2	0
	P24	9	17	0	0	0

Based on the consolidated questionnaire feedback data, an evaluation matrix for each guideline level can be constructed by dividing the number of occurrences of each program level evaluation by the total number of occurrences of these rubrics.

III. B. 2) Synthesizing the fuzzy comprehensive evaluation matrix

As a result, the fuzzy comprehensive evaluation set of school-enterprise integration performance assessment indexes for higher vocational hotel management majors can be calculated:

$$A_1 = W_1 * R_1 = (0.1923, 0.2077, 0.4715, 0.1078, 0.0092)$$
$$A_2 = W_2 * R_2 = (0.2854, 0.36, 0.2735, 0.0811, 0)$$
$$A_3 = W_3 * R_3 = (0.3599, 0.3449, 0.2706, 0.0123, 0.0123)$$
$$A_4 = W_4 * R_4 = (0.4352, 0.3982, 0.1105, 0.0561, 0)$$

From the A_1、A_2、A_3、A_4 calculated respectively, based on the weight vectors of the four first-level indicators of the school-enterprise integration performance assessment of higher vocational hotel management majors derived in the previous section, the vector of school-enterprise integration performance assessment of higher vocational hotel management majors is derived as: $A = W * R = (0.2914, 0.3134, 0.3135, 0.0726, 0.0054)$.

IV. Discussion on the path of school-enterprise integration for higher education hotel management majors

Based on the above findings, this section further applies the fsQCA research method to select four conditional variables, namely, enterprise scale, discipline type, pre-project input, and project implementation process, to explore the school-enterprise integration path of higher vocational hospitality management majors from the conditional grouping perspective, so as to enhance the performance of school-enterprise integration of higher vocational hospitality management majors.

IV. A. Necessity analysis of a single conditional variable

The results of the necessity analysis of individual conditional variables are shown in Table 5. In this paper, from the conditional grouping perspective, the fsQCA method is used to construct and standardize the truth table and analyze the four conditional variables to further explore the multiple concurrent causality of the school-enterprise integration project of the higher vocational hospitality management major to achieve high effectiveness.

Table 5: The results of the analysis of the necessity of a single conditional variable

Conditional variable		Consistency		Coverage	
		High-performance projects	Non-high performance projects	High-performance projects	Non-high performance projects
Enterprise size	X1	0.539	0.143	0.78	0.211
	~X1	0.477	0.856	0.373	0.658
Subject	X2	0.461	0.813	0.361	0.642
	~X2	0.543	0.183	0.758	0.242
Pre-project input	X3	0.805	0.391	0.878	0.381
	~X3	0.47	0.881	0.409	0.824
Project implementation process	X4	0.834	0.419	0.881	0.413
	~X4	0.423	0.869	0.426	0.849

IV. B. Sufficiency analysis of combinations of conditional variables

In this paper, we use the software fsQCA to construct the truth table and conduct standardized analysis of different combinations of conditional variables, and the four conditional variables complete the grouping configuration better, and finally form the four combination paths that can achieve high-performance projects, and the two combination paths that can achieve non-high-performance projects. The grouping configuration for realizing high/non-high-performing projects is shown in Table 6 (● indicates the presence of core conditions, ⊗ indicates the absence of core conditions, ● indicates the presence of borderline conditions, and ⊗ indicates the absence of borderline conditions), and the overall consistency of the four paths is 0.912, which is higher than the acceptable value of 0.8, which indicates that the empirical analysis has a high degree of validity. The overall coverage was 0.796, indicating that the 4 pathways were able to cover and explain more than 80% of the cases, i.e., a high degree of coverage. Therefore, these 4 groupings can be considered as a sufficiently conditional combination of the outcome variables of this paper.

According to the results of the study, the pathways that produce high performance and non-high performance are analyzed as follows:

(1) Grouping analysis of school-enterprise integration projects of higher vocational hotel management majors that produce high performance

Path 1 is expressed by the formula: high performance project = enterprise scale * ~ project pre-investment * project implementation process. Among them, the enterprise scale exists as the core condition and the project implementation process exists as the edge condition. In this grouping, when a large enterprise and a higher vocational hotel management major carry out a collaborative education program for industry-teaching integration, the project implementation process is perfect, and the project achieves high performance in spite of the average project pre-investment. The raw coverage of this pathway is 0.145, indicating that this data explains about 15% of the high performance program cases.

Table 6: The configuration of a project that implements high/non-high performance

Conditional variable	The solution of the high performance project				Non-high performance project solutions	
	Path 1	Path 2	Path 3	Path 4	Path 1	Path 2
Enterprise size	●	●	⊗	⊗	⊗	⊗
Subject		⊗	⊗	●	●	●
Pre-project input	⊗		●	●		⊗
Project implementation process	●	●	⊗	●	⊗	
Original coverage	0.145	0.488	0.031	0.266	0.721	0.744
Unique coverage	0.018	0.344	0.041	0.285	0.042	0.058
consistency	0.976	0.95	0.87	0.885	0.889	0.858
Overall coverage	0.796				0.772	
Overall consistency	0.912				0.829	

Path 2 is expressed by the formula: high performance project = firm size * ~ discipline * project implementation process. In this case, firm size and project implementation process are marginal conditions and do not appear as core conditions. Under this grouping, when a large enterprise cooperates with a higher vocational hotel management major to carry out a collaborative education program for industry-teaching integration, the project implementation process is perfect and the project will achieve high performance. The raw coverage of this pathway is 0.488, indicating that this data can explain about 49% of the high performance program cases.

Path 3 is expressed by the formula: high performance program = ~enterprise size * ~discipline * pre-project input * ~project implementation process. Pre-project inputs are the only core condition. In this grouping, when the small business and the higher vocational hospitality management major carry out a collaborative education program for industry-teaching integration, the project implementation process is average, but the pre-project inputs are in place and the project achieves high performance. The raw coverage of this pathway is 0.031, indicating that the data can explain about 3% of the high-performing program cases.

Path 4 is expressed by the formula: high performance project = ~firm size * discipline * pre-project input * project implementation process. In this case, the pre-project inputs and the project implementation process are the core conditions and the discipline type is a marginal condition. In this grouping, when small enterprises and higher vocational hotel management majors carry out the industry-teaching integration collaborative education project, the pre-project inputs are in place and the project implementation process is perfect, and the project achieves high performance. The raw coverage of this pathway is 0.266, indicating that this data explains about 27% of the program cases achieving high performance.

(2) Cohort analysis of school-enterprise integration projects of higher vocational hotel management majors that produce non-high performance

In order to test causal asymmetry, this paper analyzes the conditions of school-enterprise integration projects of higher vocational hotel management majors that produce non-high performance, and finds that there are 2 groupings of states that produce non-high-performing projects. Path 1 in the non-high-performing project group state shows that the project is not effective when the project implementation process is a lack of core conditions and the enterprise is small. Path 2 in the non-high-performing project grouping pattern, on the other hand, showed that high-performing projects could not be realized in the absence of the core condition of small size of the enterprise and the lack of pre-investment in the project.

V. Conclusion

The performance evaluation system of school-enterprise integration of higher vocational hotel management majors constructed contains 4 first-level indicators and 16 second-level indicators, in which the weight of input evaluation reaches 0.3377, indicating that the cooperation input has a decisive influence on the integration effectiveness. The comprehensive score of the empirical evaluation of a higher vocational hotel management program is 86.91, which is at a good level. The study found that the weights of building a dual-teacher team and setting up a cooperative management organization were 0.3181 and 0.2788 respectively, highlighting the importance of talent team and organizational safeguard. fsQCA analysis revealed four high-performance paths, with an overall consistency of 0.912 and coverage of 0.796. Among them, the path with the participation of large enterprises and a perfect project implementation process had the strongest explanatory power, with an original coverage of 0.488. The results of the study show that enterprise scale, project pre-investment and implementation process are the core elements affecting the performance of school-enterprise integration. The fuzzy comprehensive evaluation method effectively solves the shortcomings of traditional evaluation methods in dealing with uncertainty indicators, and provides a scientific assessment tool and improvement direction for school-enterprise integration of higher vocational hotel management majors.

References

[1] Liu, W. (2017, December). Research on Practical Teaching System of Hotel Management Major in Higher Vocational Education--in the View of Innovation and Entrepreneurship. In 2017 2nd International Conference on Education, Management Science and Economics (ICEMSE 2017) (pp. 291-295). Atlantis Press.

[2] Xiao, N., & Gao, R. (2018). Talent Cultivation Mode of" Hotel-Colleges and Universities Joint Training System". Educational Sciences: Theory & Practice, 18(5).

[3] Alexakis, G., & Jiang, L. (2019). Industry competencies and the optimal hospitality management curriculum: An empirical study. Journal of Hospitality & Tourism Education, 31(4), 210-220.

[4] Talawanich, S., & Wattanacharoensil, W. (2021). Transforming graduates into successful hotel management trainees: Exploring important management trainee competencies. Journal of Teaching in Travel & Tourism, 21(1), 43-71.

[5] Wu, M., & Lin, C. (2025). Research on the Establishment of" Post-Course-Competition-Certificate" School-enterprise Cooperation Community for Hotel Management Majors in Chinese Higher Vocational Colleges. Advances in Education, Humanities and Social Science Research, 13(1), 402-402.

[6] Yu, S., Dong, L., Liu, C., & Yang, J. (2021). A hierarchical model for talent cultivation in hospitality programmes: The case of the Hospitality Institute of Sanya. Practical Learning in Hospitality Education.

[7] Bueno, D. C. (2019). Developing a School-Hotel Industry Collaborative Environmental Management Strategy. Institutional Multidisciplinary Research and Development Journal, 2, 1-7.

[8] Zhang, J. Q. (2018, June). Practice of enterprise led construction of higher vocational teaching system under modern apprenticeship—Take the new century hotel management school in Ningbo as an example. In Proceedings of the International Conference on Computer, Communication and Network Technology (CCNT 2018), Wuzhen, China (pp. 29-30).

[9] Yin, J. (2021). Research on the School-enterprise Collaborative Talents-Cultivation Model of Hotel Management Specialty from the Perspective of Industry-education Integration. International Journal of Vocational and Technical Education, 1(2), 36.

[10] Yang, M. (2015). Evaluating collaborative innovation ability of school-enterprise cooperation. Open Journal of Business and Management, 3(1), 75-82.

[11] Xie, Z., Feng, L., & Cen, M. (2025). Research on the Design of Quality Evaluation System of Vocational Education Industry-Teaching Integration Based on Hierarchical Analysis Method. J. COMBIN. MATH. COMBIN. COMPUT, 127, 735-756.

[12] Zhou, R., & Chan, A. H. (2017). Using a fuzzy comprehensive evaluation method to determine product usability: A proposed theoretical framework. Work, 56(1), 9-19.

[13] Ling Xi,Chen Yuanyuan,Zhao Shixin & Zhu Xuanmin. (2025). The CIPP Evaluation Model: Breakdance Course Evaluation in Hip-Hop Pedagogy. Journal of Education and Learning,14(1),268-268.

[14] Zhong Lei. (2024). The Application of CIPP Model in the Evaluation of Teaching Quality of College Education in the Context of New Era. Applied Mathematics and Nonlinear Sciences,9(1).

[15] Branislav Sančanin,Aleksandra Penjišević,Dušan J. Simjanović,Branislav M. Ranđelović,Nenad O. Vesić & Maja Mladenović. (2024). A Fuzzy AHP and PCA Approach to the Role of Media in Improving Education and the Labor Market in the 21st Century.Mathematics,12(22),3616-3616.

[16] Jing Xiao & Tao Wang. (2024). Optimization of Quality Evaluation System for Innovation and Entrepreneurship Education in Colleges and Universities Based on AHP-Fuzzy Synthesis Approach. Evaluation of Educational Research,2(1).