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Exploration on the Influential Factors of College Students' Innovation and Entrepreneurship Intention Based on Analytic Hierarchy Process

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ABSTRACT

This article identifies the factors that affect college students' social entrepreneurship willingness from the perspective of individuals and colleges, and introduces the social environment as a moderating variable to analyze its role in the generation of various factors and college students' social entrepreneurship willingness. The analysis method constructs the judgment matrix of each layer, calculates the weight of each influencing factor and its overall ranking, and provides theoretical guidance and model support for local governments, colleges and universities, and college students to enhance their entrepreneurial intentions. On the basis of expert consultation, questionnaire method and practical research, a "four-in-one" innovation and entrepreneurship education evaluation index system is constructed, and the analytic hierarchy process (AHP) is used to study the innovation and entrepreneurship education evaluation system.

KEYWORDS

Innovation and Entrepreneurship Education, Analytic Hierarchy Process, Research on Development Strategies

INTRODUCTION

Entrepreneurial behavior is one of the important forces driving economic development and social progress. However, the key factors for successful entrepreneurship remain a complex and challenging issue. In order to better understand and evaluate the importance of factors influencing entrepreneurship, this article aims to establish indicators of primary and secondary factors influencing entrepreneurship, based on entrepreneurial behavior, and quantitatively study these indicators through the analytic hierarchy process (AHP) model to compare their importance. The research perspective of this article mainly focuses on the individual and university levels, aiming to identify the factors that affect the social entrepreneurship willingness of college students and introduce social environment as a moderating variable to analyze in its role in the generation of various factors and the social entrepreneurship willingness of students. In addition, this article establishes an evaluation index

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system for innovation and entrepreneurship education in universities through the AHP, aiming to provide a more scientific evaluation system for promoting the construction of the innovation and entrepreneurship education system in universities and accelerating its development. In terms of promoting the implementation path of innovation and entrepreneurship education in universities, this study proposes suggestions such as deepening education reform, optimizing curriculum design, strengthening team building, improving organizational efficiency, and creating a strong educational atmosphere. This study provides theoretical guidance and model support for local governments, universities, and college students to promote entrepreneurial intentions.

LITERATURE REVIEW

Entrepreneurship is an act of creating new economic entities. Entrepreneurs realize innovation by completing "creative destruction" activities, and innovation is an important driving force to promote national economic development. At this stage, the world is facing the test of COVID-19, and the domestic economic development is also facing great pressure. The Chinese government has comprehensively promoted the policies of "mass entrepreneurship and innovation" and "employment driven by entrepreneurship" (Ai, 2020). Innovation and entrepreneurship education in colleges and universities are a higher education measure to meet the individualized development needs of college students, improve the comprehensive quality of college students' innovation and entrepreneurship, and promote the construction of an innovative country by taking measures such as adjusting and re-establishing the professional curriculum and innovation and entrepreneurship curriculum system, optimizing the structure of teachers, enriching and developing teaching methods and teaching effect evaluation systems, and building an innovation and entrepreneurship practice teaching base in an all-round way. Under the current background, college students have become the leaders and pioneers in the wave of entrepreneurship in China (Ai, 2020). Facing the new entrepreneurial model of social entrepreneurship, although many students have realized the social significance it carries and the value of personal development, the confidence in social entrepreneurship is insufficient, and the participation rate of entrepreneurship is not high (Yuan & Hu, 2021). However, the proportion of the number of college students starting businesses to the total number of college students is about 1.4%, far lower than the level of 20-30% in developed countries. Entrepreneurship is a process of opportunity identification, and there is a strong relationship between willingness and action. It is particularly necessary to study college students' entrepreneurial intentions scientifically, find out the key influencing factors among many factors that may affect their entrepreneurial intentions, and propose targeted measures on how to cultivate and improve their entrepreneurial intentions. This study identifies the factors that affect college students' social entrepreneurship willingness from the perspective of individuals and colleges, and introduces the social environment as a moderating variable to analyze in its role in the generation of various factors and college students' social entrepreneurship willingness (Zhou & Zhou, 2022).

The cultivation of scientific and technological innovation ability of college students is an important part of higher education in China (Wang et al., 2018). It has positive significance and an important role for the development of higher education in China. Regarding the research on the influencing factors of college students' entrepreneurship, Zhang (2007), starting from the background of students' entrepreneurship, analyzed the typical cases of entrepreneurship and found that the factors influencing students mainly include their own factors, family factors, school factors, social factors, classmates and friends' factors, and management factors (as cited in Ye, 2009). Y. Ming and A. Junxue (2009) divided the factors affecting college students' entrepreneurial activities into subjective factors and objective factors. The subjective factors include interest, skills, ability, talent, motivation, characteristics, experience and other self-factors, while the objective factors include family factors, school factors, social factors, and project selection (as cited in Georgescu & Herman, 2020). Li analyzed the restrictive factors of innovation and entrepreneurship ability, and X. Song put forward his own views on how

to improve the innovation and entrepreneurship ability of vocational college students, that is, to provide communication channels for students through innovation competitions, stimulate students' creative motivation, and provide effective ways to cultivate students' innovation ability (as cited in Xu et al., 2016). At present, much domestic research on entrepreneurial influencing factors has been carried out from the aspects of entrepreneurial intention, entrepreneurial motivation, entrepreneurial decision-making, and entrepreneurial ability (Lu et al., 2021). Some scholars have explored the relationship between entrepreneurial tendency and individual characteristics and background factors from the perspective of psychology and studied the relationship between entrepreneurs' personal characteristics and entrepreneurial motivation, professional knowledge level, etc (Tiwari et al., 2017). However, the existing research mainly analyzes the correlation of the influencing factors of college students' entrepreneurial intention, and mainly focuses on descriptive research, with less ranking of the importance of relevant factors, and less quantitative empirical research. Entrepreneurial intention or entrepreneurial tendency and entrepreneurial ability are the preconditions for the emergence of entrepreneurial behavior (Ali et al., 2010). Therefore, the entrepreneurial influencing factors discussed in this paper are based on entrepreneurial behavior, establishing indicators of the main and secondary factors of entrepreneurial influence and conducting quantitative research on the indicators through the analytic hierarchy process model, so as to compare the importance of each of them.

MATERIALS AND METHODS

Entrepreneurship

J.A. Schumpeter, an American economist, believed that entrepreneurs are innovators engaged in "creative destruction." Economist A. Marshall once said that an entrepreneur is an organizer of a business venture, especially a person who organizes, owns, manages, and undertakes all the risks in this business. In English, *entrepreneur* means to create an enterprise and act as the director of management responsibility. However, only those managers with innovative thinking and outstanding performance can be called entrepreneurs.

For the word *entrepreneurship*, the dictionary defines it as starting a new business, which represents the birth of a new form of organization. The research on entrepreneurship began in the middle of the 18th century. The French economist R. Cantillon first proposed the concept of entrepreneur in his economics works and opened up a precedent for research on entrepreneurship. P. Hatthakijphong and H. I. Ting regarded opportunities in the environment as the starting point of entrepreneurial activities and regard entrepreneurship as a process of comprehensive utilization of opportunities; Jiang and others regarded entrepreneurship as a multi-factor comprehensive effect of entrepreneurs, social capital, and operation models. L. Wang Lingling and others pointed out that the ability to acquire and utilize entrepreneurial resources is the key to entrepreneurial success; scholars X. Zhang and others emphasized the impact of the environment on entrepreneurship and pointed out that entrepreneurship is an inherent social process full of uncertainty, and that the social environment effect cannot be ignored (as cited in Lihua, 2022).

On the whole, entrepreneurship is a dynamic process, and scholars at home and abroad have carried out research from the development of opportunities, the integration and utilization of resources, the environment, and the entrepreneur's own ability. This study believes that entrepreneurship is an individual or team with leadership, management, innovation, and other abilities used to seize opportunities in the environment in a timely manner, to create new organizations, develop new products or services by integrating resources, and market them to realize economic value (Niu et al., 2019).

Social entrepreneurship, as a new entrepreneurial model that has only emerged and developed globally since the 1940s, is generally regarded as a social innovation model that helps solve complex social problems. Social entrepreneurship is a process of exploring and developing opportunities to meet social needs with a more sustainable innovation model. Combined with pure charity and marketization, it has both commercial and social values and has its own uniqueness compared to the corresponding

departments in terms of beneficiaries, capital, labor, suppliers, etc. It is the result of cross research on entrepreneurship management, sociology, and public management. The discussion of its concept has never stopped. Scholars have defined and interpreted it from multiple perspectives, so that the concept of social entrepreneurship presents diverse characteristics. Lu et al.(2021) defined social entrepreneurship from the perspective of enterprise operation and believed that social entrepreneurship is to use the principles and methods of commercialization to improve and innovate social services. The operation of social enterprises should make full use of commercial means to better create social value. From the perspective of resource integration, social entrepreneurship is explained, and social entrepreneurship is regarded as a process of creatively integrating resources to realize social value, emphasizing the need to seize entrepreneurial opportunities to achieve social change; Martin et al. The aim is to create a new and better, balanced society. Scholar Y. Liu and others concluded that social entrepreneurship has multi-faceted characteristics by combing domestic and foreign research on social entrepreneurship. It can not only make up for the shortcomings of government function failure and bring new social changes, but also create new market opportunities; Xu et al. (2016) Define social entrepreneurship as individuals creatively providing sustainable solutions to social problems by identifying opportunities in market failures and applying the dual logic of social welfare and commercialization (as cited in Shen et al., 2022).

College Students' Entrepreneurship

As we all know, the employment of college students is a very serious problem. We cannot rely solely on the supply-demand relationship in the labor market to solve the problem of employment difficulties for college students. Instead, we should open up a new road that is effective, innovative, and suitable for the development of the potential of contemporary youth. College students' entrepreneurship is another channel for them to realize their own value. It has been widely favored and is also a form of employment advocated by the government. The local governments of various provinces and cities have responded and formulated various practical measures to support innovation, including building a unique maker space, lowering the threshold for entrepreneurship and innovation, streamlining administration and delegating power, reducing fees, improving the public service functions of maker makers. To improve the financial service system, we need to innovate equity financing methods, increase credit support, increase fiscal and taxation policies and financial support, implement tax reduction and exemption policies, encourage colleges and universities to establish innovation and entrepreneurship colleges, and allow college students to suspend their studies and start businesses, etc. (Sukoco et al., 2020).

We are in an era of entrepreneurship, a society eager for innovation. The government attaches great importance to and encourages innovation and entrepreneurship. It is unprecedented for people to place such high hopes on innovation and entrepreneurship. Innovation and entrepreneurship have become a social fashion and value orientation. It is regarded as one of the most important driving forces to keep the Chinese economy going. The majority of young people, especially college students, will be the main force to invest in this entrepreneurial army. This is a great opportunity for contemporary college students to achieve careers in the background of the times, and the entrepreneurial group effect has gradually realized the transformation from the niche to the public. Many signs show that the current period is the best time to start a business, and it is the outlet of the times. As long as contemporary college students can firmly grasp the pulse of this era and improve their entrepreneurial competencies, they are more likely to take the lead in this entrepreneurial competition (Fanea-Ivanovici & Baber, 2021).

According to a survey, 85% of domestic college students have the intention to start a business, but only 44% of college students have started a business, and only 1.1% have successfully started a business. However, the main unsatisfactory factors that restrict college students' entrepreneurship are lack of funds and experience. Therefore, it is not difficult to see the difficulty of college students'

entrepreneurship. At the same time, college students also urgently need support and help from the outside world.

In recent years, entrepreneurship education in colleges and universities has attracted great attention and active participation from the Ministry of Education, the Ministry of Human Resources and Labor and Social Security, the Central Committee of the Communist Youth League, the All-China Youth Federation, and other departments. In 2019, the Ministry of Education determined that eight universities, including Renmin University of China, Tsinghua University, and Beijing University of Aeronautics and Astronautics, take the lead in the pilot work of entrepreneurship education and formed three typical entrepreneurship education models, namely, "classroom entrepreneurship education," "practical entrepreneurship education," and "comprehensive entrepreneurship education." Also introduced and carried out were entrepreneurial projects of the International Labour Organization, such as KAB, SIYB and YBC. As various forms of entrepreneurship and employment education are widely carried out in colleges and universities, how to correctly understand entrepreneurship education, maximize the use of social resources, carry out entrepreneurship education to improve college students' entrepreneurial ability, cultivate more entrepreneurs, and achieve the goal of promoting employment through entrepreneurship is an urgent problem to be solved at present.

Hierarchy of Needs Theory

Born in the middle of the 20th century, the hierarchy of needs theory was proposed by A. Maslow, a famous scholar in the field of psychology. The individual's value orientation and goal pursuit that the level needs are a manifestation of a broad view of human nature and values (as cited in Li, 2022).

Maslow believed that individual needs have different levels and stages of variability, and people's needs from low to high are expressed as the needs for physiology, safety, emotional belonging, respect, and self-realization. He also points out that the lower-level needs are more basic, and only unmet needs are the source of individual motivation and behavior. With the gradual satisfaction of lower-level needs such as material needs, people's inner needs will become closer and closer to Maslow's highest-level needs, that is, self-actualization needs. The need for self-realization, as the highest level of need, is the process in which individuals hope to realize lofty ideals in life through their own efforts, and this self-realization is an important embodiment of personal professional values. Today in the 21st century, for college students living in a market economy environment where material life is relatively rich, the requirements for spiritual life are getting higher and higher. They are eager to become participants and creators of social life in order to realize their own life value. As a lofty and worthy cause, social entrepreneurship has a mission to make society better. This entrepreneurial process provides students with the motivation to challenge themselves and the inherent temptation to realize the value of life, which will satisfy to a large extent. Their self-actualization needs not only to prompt students to develop a strong willingness to social entrepreneurship, but also to make them form a sense of mission to undertake social responsibilities through social entrepreneurship. The stronger this need, the more eager to solve social problems in innovative ways, generate social entrepreneurial behavior, and then realize personal and social value (Zhao et al., 2017).

Entrepreneurship requires higher comprehensive ability of college students. Entrepreneurs should not only understand business but also be good at management. College students should not only be able to coordinate and deal with all aspects of the relationship, but also be able to make prompt decisions and command decisively; they should be able to blaze new trails and not be afraid of setbacks and difficulties. Therefore, it is suggested that colleges and universities at all levels should strengthen the cultivation of college students' entrepreneurial awareness, entrepreneurial knowledge, and entrepreneurial ability, and the institutions should strive to create excellent conditions for college students to start their own businesses. At the same time, the government will put more energy on entrepreneurship guidance services for college students. In addition, the lack of funds is the main constraint factor for college students to start their own businesses. The whole society should try its

best to provide preferential conditions and financial support for college students in this respect and enthusiastically and actively provide help for college students to start their own businesses.

Social Cognitive Theory

Social cognitive theory explains self-development, adaptation, and change from an agentic perspective. Agency means that people intentionally regulate and control their own functions and living environment. The theory holds that people have the characteristics of self-organization, self-regulation, and self-reflection. There is a dynamic two-way interaction between individual behavior and social structure, that is, people are not only the product of living environment, but also act on their own living environment.

Scholars have tried to study entrepreneurial activities from different perspectives and using different disciplinary thinking. Among them, A. Bandura's social cognition theory provides new ideas for exploring the mechanism of individual entrepreneurial behavior. The social cognition theory was initially centered on the social learning theory, with observational learning as the main point of view, and later expanded its perspective to the external environment and individual internal factors that affect the individual's psychological and behavioral activities, resulting in the emergence of ternary interaction theory and self-efficacy theory, which together constitute the overall framework of social cognitive theory, which also plays an important theoretical foundation for the study of entrepreneurship. The theory is mainly composed of the following two parts (F. Zhang & Xi, 2021):

(1) Observational learning theory

As an exemplary learning method, observational learning can stimulate creative behavior. On the one hand, the observer learns skills and knowledge, having never been exposed to them through observation and, on the other hand, the observed creative behavior can to a certain extent give learners useful tools. To open up ideas and perspectives for observers and stimulate their innovative potential, it can be seen that observation and learning can not only promote the acquisition of practical experience of others, but also enhance their own creativity (Rii et al., 2020).

(2) Self-efficacy theory

Social cognitive theory affirms that individuals have the ability of self-regulation and to influence people's thinking, motivation, emotional state, and self-directed behavior through the role of self-guidance. At the same time, self-regulation has a dual control system, that is, a positive deviation generation system and a negative deviation reduction system work together. Man is not only a reaction organism, but also an organism with ambition and initiative. The ability of human beings to think in advance enables them to carry out selective control activities in a planned way, rather than simply reacting to the results of their efforts. Cognitive theory incorporates the concept of self-efficacy into the self-regulation mechanism. Self-efficacy, also known as self-belief, refers to an individual's self-assessment and judgment on whether one has the ability to complete specific behaviors and reflects the individual's self-confidence in his or her ability level. This concept can be understood from three aspects: First, self-efficacy is an individual's subjective assessment of whether that person is able to complete a specific task or activity, which does not mean that one actually has this ability. Second, the sense of self-efficacy is not a simple judgment of an individual's ability, but a judgment and evaluation of the specific degree to which an individual's ability can be combined with actual actions (Gao, 2021).

Realistic entrepreneurship practice and cognitive theory show that self-efficacy plays a very important role in the process of college students' innovation and entrepreneurship, is a self-motivation incentive to drive the realization of the goals of mass entrepreneurship and innovation, affects the self-

management and control of mass entrepreneurship and innovation behavior, and has a strong predictive role in the degree of effort and persistence of college students' mass entrepreneurship and innovation behavior. According to the influencing factors of self-efficacy, colleges and universities should adopt various ways to promote college students' self-efficacy in entrepreneurship and innovation education.

Analytic Hierarchy Process

The evaluation system of innovation and entrepreneurship education in colleges and universities should adhere to the quality improvement as the core, adhere to the "three innovation" education concept, adhere to the combination of "adult" education and "talent" education, and establish a multi-level and three-dimensional innovation and entrepreneurship teaching system.

AHP is a decision analysis method proposed by American mathematician T. L. Saaty in 1970 (Niu et al., 2019). It helps decision-makers make reasonable decisions by hierarchically structuring decision-making problems, analyzing the importance and priority between each layer. The AHP is widely used in various fields, including engineering management, investment decision-making, supply chain management, and human resource management, etc. It provides a systematic and structured approach to dealing with complex decision-making problems and helps decision-makers clarify their thinking, weigh pros and cons, and make effective decisions. The basic steps of AHP are as follows:

(1) Defining goals: Clarify the decision-making problem and decompose it into different goals, criteria, and solutions.
(2) Establish a hierarchical structure: Organize goals, guidelines, and plans according to a hierarchical structure to form a tree diagram.
(3) Set judgment matrix: For each level, establish a judgment matrix by comparing the importance of different elements pairwise.
(4) Calculate weight: Calculate the weight of each element by performing eigenvalue decomposition or stepwise approximation on the judgment matrix.
(5) Consistency check: Check the consistency of the judgment matrix to ensure that the consistency ratio (CR) of the judgment matrix is within an acceptable range.
(6) Comprehensive evaluation: Based on the calculated weights, conduct a comprehensive evaluation of each element to obtain the final decision result.

The method determines the relative weight of each layer against the previous layer and finally sorts the indicators according to the empirical judgment of experts. The specific process is shown in Figure 1.

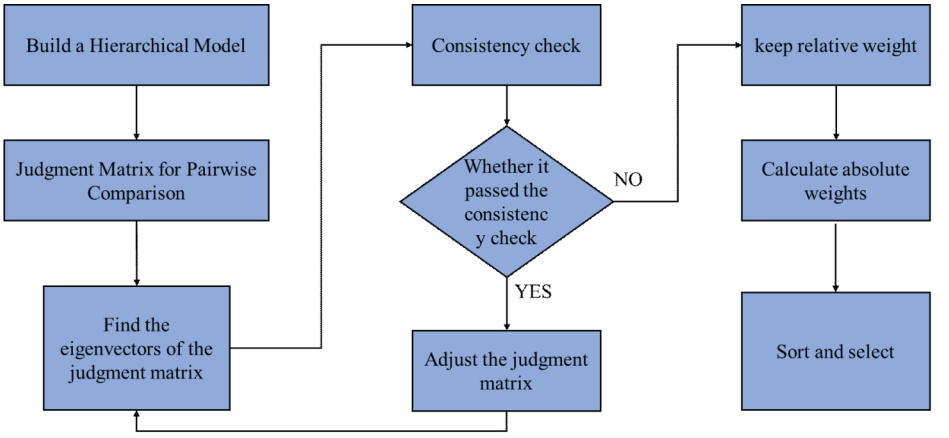
The result obtained after normalization is the relative weight of a certain primary element represented by this judgment matrix corresponding to the upper element. The specific method (Jiang et al., 2022):

(1) Assuming that the number of criteria for layer B is n, use the sum-product method to normalize each column of the judgment matrix A of A-B_i, and obtain the normalized judgment matrix. In:

$$\overline{a}_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, (j = 1, 2, \cdots, n) \tag{1}$$

(2) Find the sum of each row of the normalized judgment matrix, we have:

Figure 1. Flowchart of the application of AHP



$$\omega_i = \sum_{j=1}^{n} \overline{a}_{ij}, (i = 1,2,\cdots,n) \tag{2}$$

(3) Then normalize the vector, let:

$$\omega_i^{(1)} = \frac{\omega_i}{\sum_{j=1}^{n} \omega_j}, (i = 1,2,\cdots,n) \tag{3}$$

(4) The relative weight of the target layer A to the criterion layer B can be obtained as:

$$W^{(1)} = \left(W_1^{(1)}, W_2^{(1)}, \cdots, W_n^{(1)}\right)^T \tag{4}$$

(5) In the same way, the relative weights of the index layer C to the criterion layer Bi are (Lou, 2021):

$$W_i^{(2)} = \left(W_{1i}^{(2)}, W_{2i}^{(2)}, \cdots, W_{ti}^{(2)}, \cdots, W_{mi}^{(2)}\right)^T \tag{5}$$

Among them, i=1,2,…,n; t=1,2,…,m; m is the number of criteria in the criterion layer Bi.

(6) Finally, the relative weight of the index layer C relative to the criterion layer B can be obtained as (Ordoñez de Pablos, 2022):

$$W^{(2)} = \left(W_1^{(2)}, W_2^{(2)}, \cdots, W_t^{(2)}, \cdots, W_n^{(2)}\right)^T \tag{6}$$

Only the judgment matrix that passes the consistency check and the relative weight obtained according to step 3 is acceptable. Otherwise, the judgment matrix must be readjusted. Whether to pass the consistency test is mainly judged according to the consistency index C.R (Hatthakijphong & Ting, 2019):

$$C \cdot R = \frac{C \cdot I}{R \cdot I} \tag{7}$$

Among them, C.I is the consistency index of single sorting, and the calculation formula is (Y. Zhang, 2021):

$$C \cdot I = \frac{\lambda_{\max} - n}{R.I} \tag{8}$$

Hierarchical total ranking means that after obtaining the relative weights calculated by all the judgment matrices that meet the consistency requirements, it is necessary to further calculate the comprehensive weights of all factors relative to the overall target, which can also become absolute weights. The calculation formula (Guo, 2021, December) is:

$$W^{(0)} = w^{(2)} \times w^{(1)} = \left(w_1^{(0)}, w_2^{(0)}, \cdots, w_m^{(0)}\right)^T \tag{9}$$

in:

$$\omega_t^{(0)} = \sum_{t=1}^{n} \omega_i^{(1)} \times \omega_{ti}^{(2)} \tag{10}$$

In theory, the total ranking of the hierarchy should also be checked for consistency but, in practice, this step is usually omitted (B. Wang, 2019). On the one hand, when experts make pairwise comparisons and judgments under a single criterion, it is often difficult to take into account the overall consistency; on the other hand, when the overall consistency is not satisfied, the adjustment work will become very cumbersome. Therefore, in general, the consistency check is only performed in the single-level sorting. After the comprehensive processing of the above five steps, the weight value of each scheme for the overall goal will be finally obtained.

Fuzzy Analytical Hierarchy Process

The significant advantage of the 1-9 scale method given by Professor Saaty in the traditional AHP is that the evaluation process is intuitive and does not require more information, but this method also has some drawbacks, that is, during the evaluation process, there is excessive reliance on the personal experience and subjective opinions of experts. In view of this, Laarhoven and Pedrycz made a fuzzy extension of Saaty's method, and Buckley developed a fuzzy AHP based on the research of Laarhoven and Pedrycz (Niu et al., 2019). Fuzzy analytic hierarchy process (FAHP) is a decision-making method based on fuzzy mathematics and analytic hierarchy process. It introduces fuzzy mathematical theory on the basis of AHP to deal with fuzziness and uncertainty problems and is used to solve complex decision-making problems with multiple factors, levels, and objectives. Unlike traditional AHP, FAHP

uses fuzzy numbers instead of deterministic values to describe decision-makers' fuzzy cognition and degree of uncertainty regarding certain indicators or factors. Fuzzy numbers are composed of a real number and a membership function, which represents the fuzzy region where the indicator or factor is located. The main steps of FAHP include:

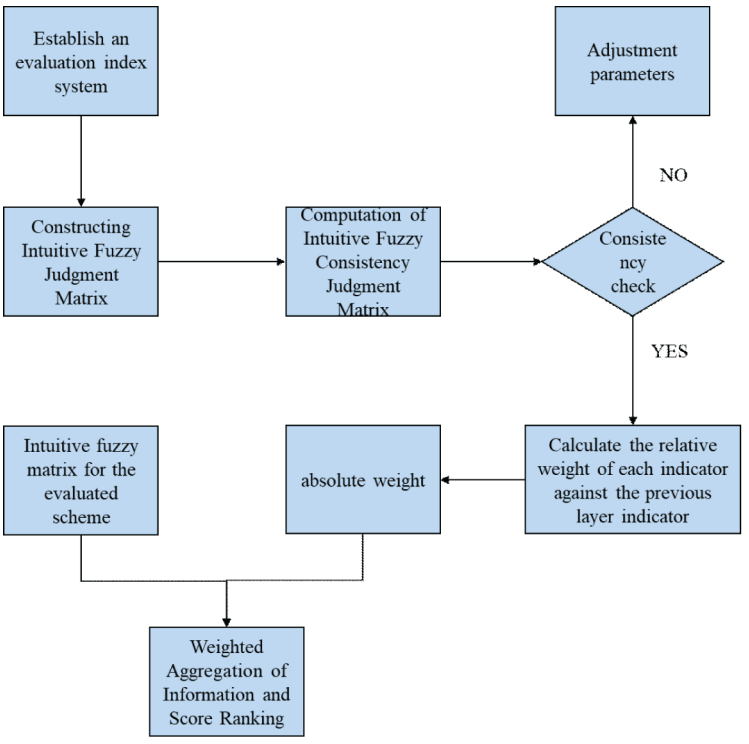
(1) Establish a hierarchical model: Decompose the decision-making problem into several levels and establish a hierarchical model.
(2) Determine the judgment matrix: Collect the judgment matrix between various factors through questionnaire surveys, expert interviews, and other methods.
(3) Calculate weight: Calculate the weight of each factor to reflect its importance in the entire hierarchical model.
(4) Fuzzy comprehensive evaluation: The weight of each factor and the fuzzy number of evaluation indicators are subjected to fuzzy comprehensive evaluation to obtain the final decision result.

The fuzzy AHP converts the original 1-9 scale into a fuzzy number for representation and constructs a fuzzy judgment matrix, which can add objectivity to the traditional AHP, but the fuzzy set only considers the membership degree in expert evaluation. In this aspect, the retention of evaluation information is still not comprehensive, as shown in Figure 2.

In order to make up for the deficiency of fuzzy AHP, Professor Z. Xu proposed the intuitionistic fuzzy AHP, which injected new vitality into the classical AHP theory.

Intuitionistic fuzzy analytic hierarchy process (IFAHP) is a decision-making method that introduces the theory of intuitionistic fuzzy mathematics on the basis of fuzzy AHP. It uses intuitive fuzzy numbers to describe the fuzzy cognition and uncertainty level of decision-makers toward

Figure 2. The application process of intuitionistic fuzzy AHP



indicators or factors, in order to handle complex decision-making problems. In the traditional FAHP, fuzzy numbers consist of a real number and a membership function, used to represent the decision-maker's level of fuzzy cognition and uncertainty about indicators or factors. In the theory of intuitionistic fuzzy mathematics, fuzzy numbers are composed of three parameters: membership, nonmembership, and uncertainty. Among them, membership degree represents the degree of membership of indicators or factors, nonmembership degree represents the degree of nonmembership of indicators or factors, and uncertainty represents the degree of uncertainty of indicators or factors. The main steps of IFAHP include:

(1) Establish a hierarchical model: Decompose the decision-making problem into several levels and establish a hierarchical model.
(2) Determine the judgment matrix: Obtain the judgment matrix between various factors through expert interviews, questionnaire surveys, and other methods.
(3) Calculate weights: Based on intuitionistic fuzzy number theory, calculate the weights of each factor to reflect their importance in the entire hierarchical structure model.
(4) Intuitionistic fuzzy comprehensive evaluation: The weight of each factor and the intuitionistic fuzzy number of evaluation indicators are used for intuitionistic fuzzy comprehensive evaluation to obtain the final decision result.

The IFAHP method can more accurately reflect decision-makers' cognition and subjective feelings toward indicators or factors, while considering factors such as membership, nonmembership, and uncertainty, improving the reliability and effectiveness of decision results. It is widely used in complex decision-making problems, such as risk assessment, project selection, supplier evaluation, and so on.

The theoretical basis of the intuitionistic fuzzy AHP is the intuitionistic fuzzy set. Let X be a universe of discourse, and an intuitionistic fuzzy set A on X is defined as:

$$A = \left\{ x, \mu_A(x), v_A(x) \middle| x \in X \right\} \tag{11}$$

in:

$$\mu_A : X \to [0,1], v_A : X \to [0,1] \tag{12}$$

μA(x) and vA(x) respectively represent the membership degree and non-membership degree of the element x on X belonging to the fuzzy set A, and satisfy the condition:

$$\pi_A(x) = 1 - \mu_A(x) - v_A(x) \tag{13}$$

Set A. Next, use the consistency test formula to test:

$$d(\bar{R}, R) = \frac{1}{2(n-1)(n-2)} \sum_{i=1}^{n} \sum_{j=1}^{n} \left(\left| \bar{\mu}_{ij} - \mu_{ij} \right| + \left| \bar{v}_{ij} - v_{ij} \right| + \left| \bar{\pi}_{ij} - \pi_{ij} \right| \right) \tag{14}$$

When all the judgment matrices are properly processed, the relative weight can be calculated. The corresponding calculation formula is:

$$\omega_i = \left(\frac{\sum_{j=1}^{n} \mu_{ij}}{\sum_{i=1}^{n}\sum_{j=1}^{n}\left(1-v_{ij}\right)}, 1 - \frac{\sum_{j=1}^{n}\left(1-v_{ij}\right)}{\sum_{i=1}^{n}\sum_{j=1}^{n}\mu_{ij}} \right) \tag{15}$$

Combining intuitionistic fuzzy sets with FAHP, establishing the mathematical model of IFAHP is an important extension of FAHP, which is more flexible and practical in dealing with uncertainty.

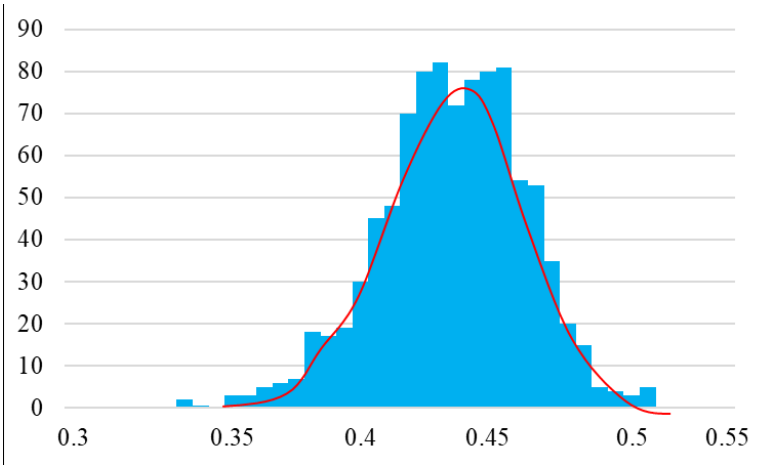
RESULTS AND ANALYSIS

Analysis of Entrepreneurial Ability

This paper uses the MATLAB2016b software to conduct a simulation experiment. The reason for choosing MATLAB 2016 in this article is because the software is widely used and has powerful functions in the research field. And the researchers are already familiar with and possess the relevant skills of MATLAB, so they choose to use MATLAB for simulation experiments. MATLAB has powerful data processing and analysis capabilities, which can weight and calculate scores on 1000 sets of intuitionistic fuzzy numbers generated and draw statistical distribution histograms. These features helped the author conduct comprehensive data analysis and result presentation. That is to say, 1000 groups of intuitionistic fuzzy numbers are randomly generated through MATLAB2016b to simulate the intuitionistic fuzzy evaluation of 1000 entrepreneurs by experts, then these evaluation matrices are weighted with the weight calculated previously, and then these 1000 entrepreneurs are calculated according to the score function to establish a specific score model for entrepreneurs. The statistical distribution histogram is drawn according to 1000 specific score values, and it can be observed that its shape is similar to the graph of the normal distribution function. After function fitting, the results shown in Figure 3 are obtained.

Suppose entrepreneurs 1, 2, 3, 4, and 5 all belong to team M, and entrepreneurs 6, 7, 8, 9, and 10 all belong to team N. The score of each of them can be drawn into a radar chart. The radar chart is a graph that displays multi-dimensional data in two-dimensional form. It can compare the differences between indicators intuitively. It is generally used in financial statement analysis. Its characteristics are also more suitable for the application of the analysis and comparison of team competency in

Figure 3. The fitting result of the simulation experiment function of college students' entrepreneurial competency



this paper. Therefore, the radar chart is used to describe the entrepreneurial competency of college students' entrepreneurial teams, and the area enclosed by the scores of each person in the team can be regarded as the comprehensive competency of the team. The final result is shown in Figure 4.

It is easy to see from the graph comparison that the area enclosed by the comprehensive scores of the five members of team N is obviously larger than that of team M, so it can be inferred that the comprehensive entrepreneurial competence level of team N is better than that of team M. The conclusions obtained by this model in this example are the same as those of Model 2, and the conclusions are mutually verified, indicating that both models can be used to evaluate the competence level of the team to a certain extent. At the same time, we can find that Entrepreneur 7 and Entrepreneur 10, who are rated as high level, are both on Team N, while Entrepreneur 2 and Entrepreneur 3, who are rated as low level, are both on Team M. This should be the reason why Team N achieves better performance regardless of whether the composite model or the single metric model is applied.

Regression Analysis of Factors Influencing Entrepreneurial Intentions

Through the one-way ANOVA, the results are shown in Figure 5. The F-value of the one-way ANOVA of entrepreneurial intention for different age groups is 2.469, and the corresponding P value is 0.118. It can be seen that P>0.1, Test hypothesis H1-2, the analysis results show that there is no significant difference in the online entrepreneurial intention of students of different age groups, and the null hypothesis is rejected.

Through one-way ANOVA, the results are shown in Figure 6. The F value of entrepreneurial intention to professional one-way ANOVA is 0.933. The research results of some scholars show that the entrepreneurial intention of economic and management students is greater than that of literature and history students.

Regarding the students with or without internet internship or part-time experience, the difference test of online entrepreneurship willingness is shown in Figure 7. The independent sample test value of entrepreneurial intention on the difference analysis of internship or part-time job is 4.480. It verifies the hypothesis H1-6 that there is internet internship or part-time job. The students with experience are more willing to start a business than those without internship experience. Through interviews and research, it is also found that some students have never been exposed to entrepreneurship and have little knowledge about entrepreneurship, but students who have had internship experience are obviously more interested in entrepreneurship, and they feel that predictable risks can be taken.

Figure 4. Comparison results of team entrepreneurial competence

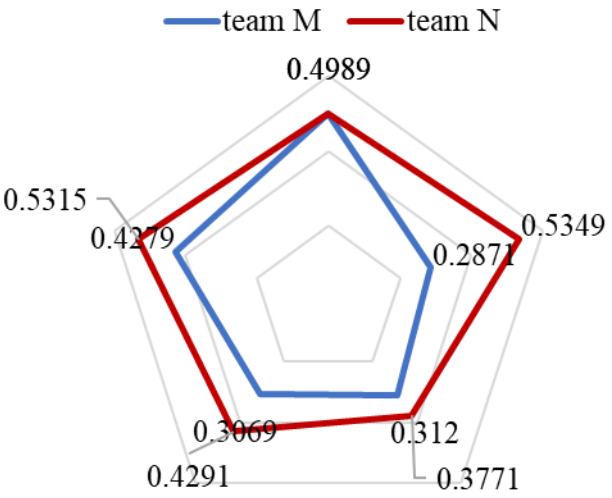


Figure 5. Difference analysis of online entrepreneurial intentions for different ages

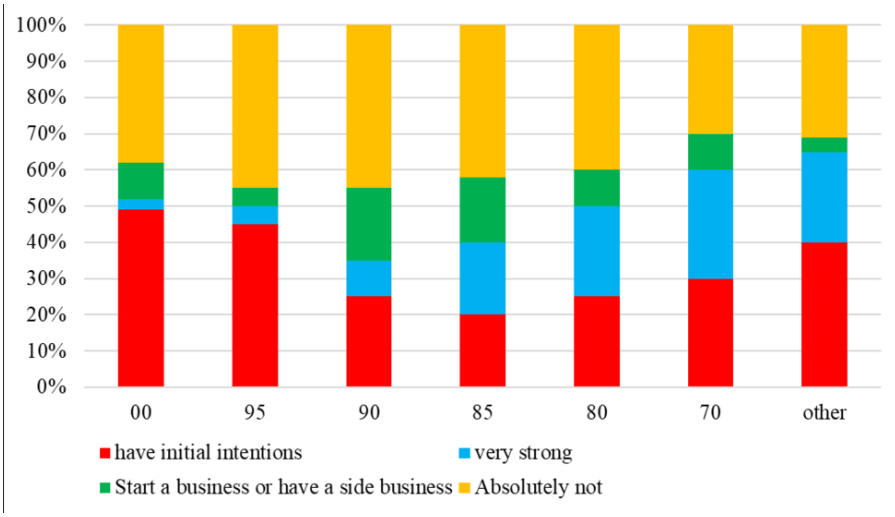


Figure 6. Difference analysis of online entrepreneurial willingness to different majors

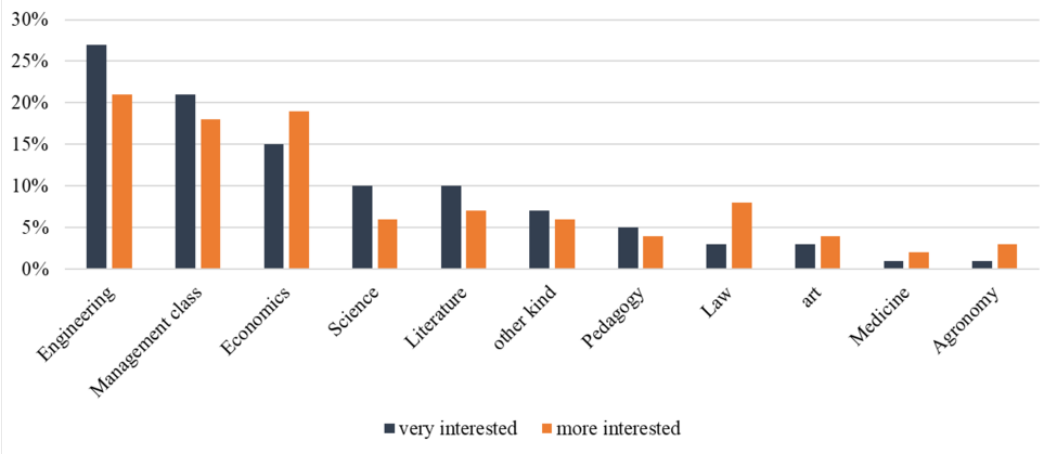
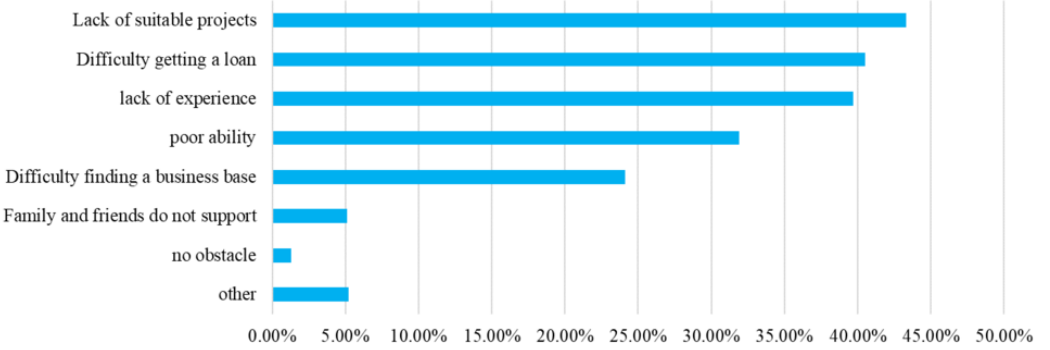


Figure 7. Analysis of differences in online entrepreneurship intentions of different internet internship or part-time students



For college students, whether they are willing to start a business and the intensity of their entrepreneurial intention depend on the reserve of entrepreneurial knowledge and entrepreneurial motivation. Entrepreneurial knowledge refers to various knowledge and skills that should be possessed before and during entrepreneurship, such as understanding of entrepreneurial policies, laws and regulations, technical knowledge, leadership and management ability, etc. The research shows that entrepreneurship education in schools has an important impact on college students' entrepreneurial behavior, while professional education and social entrepreneurship policies have an important impact on college students' entrepreneurial behavior.

In view of the importance of personality characteristics in the influencing factor indicators in this paper and the formation of entrepreneurial cognition, in the training of talents in colleges and universities, the teaching content and methods should focus on the development of students' entrepreneurial personality characteristics and provide multi-channel entrepreneurial practice training opportunities to improve college students' entrepreneurial cognition through innovation and entrepreneurship competitions, entrepreneurial community activities, and exchange activities of school-enterprise cooperation projects. For college entrepreneurs, the government has issued a large number of entrepreneurial support policies and subsidies. Because of the inadequate publicity and implementation, and the lack of their own social experience, they sometimes do not really enjoy the policy benefits. Entrepreneurship education is not the task of colleges and universities. All sectors of society should make their due efforts to this end.

Analysis of Real-World Applications

In today's business environment full of opportunities and challenges, entrepreneurs play a crucial role. They bring innovation, employment opportunities, and economic growth but, at the same time, they also face enormous risks and uncertainties. Therefore, evaluating the potential and abilities of entrepreneurs has become one of the important tasks for investors, incubators, and government related institutions. However, traditional evaluation methods are often subjective and lack scientific basis, making it difficult to comprehensively and accurately evaluate the actual situation of entrepreneurs. In this context, it is particularly important to establish a scientific entrepreneur evaluation model. This article aims to explore the establishment of an evaluation model for entrepreneurs, in order to more accurately evaluate their potential and abilities, and provide scientific basis for actual entrepreneurial decision-making. Through the practical application of this model, we have the potential to improve the entrepreneurial ecosystem, promote the development of innovation and entrepreneurship, and provide more accurate decision-making support for investors and policy makers. This article will contribute to the following research.

(1) Entrepreneur evaluation: This model can be used to evaluate entrepreneurs, based on expert intuitive fuzzy evaluation and weighted calculation of entrepreneur scores. This helps investors, incubators, or other relevant institutions make more scientifically sound decisions when evaluating entrepreneurial projects.
(2) Risk management: By establishing a scoring model for entrepreneurs, it is possible to better identify and evaluate the risks of entrepreneurial projects. This helps investors or related institutions to better control risks in the decision-making process and provide decision-making basis.
(3) Entrepreneurship support and guidance: Based on the results of the entrepreneur score model, customized support and guidance can be provided for entrepreneurs. By understanding the strengths and weaknesses of entrepreneurs, relevant training, consultation, and resource support can be provided to help them better develop and succeed.
(4) Entrepreneurship policy formulation: The results of the entrepreneur score model can provide reference for the government or relevant institutions to formulate entrepreneurship policies. By

understanding the needs and characteristics of entrepreneurs, targeted policies and measures can be formulated to support entrepreneurship.

In summary, the practical application of this study is mainly in the fields of entrepreneurship assessment, risk management, entrepreneurship support, and entrepreneurship policy formulation, providing scientific data and decision-making basis for relevant institutions and decision-makers to promote the development of the entrepreneurial ecosystem and the success of entrepreneurs.

Although this study conducted simulation experiments using MATLAB, established a scoring model for entrepreneurs, and explored its potential effects in practical applications, there are still certain limitations to this study:

(1) Sample limitation: The sample of entrepreneurs used in this study may have some deviation, because only entrepreneurs from the Chinese mainland are considered. Not considering entrepreneurs or multinational corporations from other countries and regions may reduce the applicability of the model. To improve the applicability and reliability of the model, the sample range can be expanded by adding samples of entrepreneurs from multinational corporations and other countries or regions. At the same time, multiple methods can be used to collect empirical data, such as questionnaire surveys, face-to-face interviews, literature analysis, etc., to improve the quality and accuracy of the data.
(2) Model accuracy: Although complex calculations and simulations were conducted using MATLAB in this study, there are still many subjective factors that affect the accuracy of the model, such as the subjective judgments and weighted calculations of experts. At the same time, in practical applications, more complex variables need to be considered, such as market changes, economic fluctuations, and other factors, which can also affect the accuracy of the model. In order to reduce subjective factors and improve accuracy of the model, more scientific calculation methods and weight allocation methods can be adopted, such as using machine learning and artificial intelligence technology for model training and prediction. In addition, more indicators can be utilized to enrich the model, such as brand value, social responsibility, industry leadership, etc.
(3) Insufficient empirical data: The empirical data collected in this study is relatively limited, making it difficult to cover all the characteristics and behaviors of entrepreneurs. In addition, there may be errors or missing data for certain indicators, which can affect the results and reliability of the model. In order to eliminate errors and missing empirical data, data cleaning and statistical analysis methods can be used, such as regression analysis, factor analysis, cluster analysis, etc., to improve the quality and credibility of the data.
(4) Application scope: The model of this study is mainly aimed at startups and individual entrepreneurs and is difficult to apply to the evaluation of mature enterprises and large multinational corporations. Therefore, in practical applications, it is necessary to decide whether to use the model based on specific circumstances.

In summary, the limitations of this study mainly include sample limitations, model accuracy, insufficient empirical data, and application scope, all of which can affect the effectiveness and practical application of the model. In order to make the model more flexible and applicable, the indicators and weights of the model can be adjusted according to different application objects and scenarios to meet the needs and expectations of different users. At the same time, it is necessary to strengthen the practical application and evaluation of the model, continuously optimizing and improving the model.

CONCLUSION

Entrepreneurial behavior is one of the important forces driving economic development and social progress. However, the key factors for successful entrepreneurship remain a complex and challenging issue. Entrepreneurs need to face numerous risks and uncertainties, including challenges in market competition, resource constraints, and management capabilities. At the same time, the entrepreneurial process also involves multiple elements such as personal qualities, teamwork, innovation ability, and market insight. This study conducted a quantitative analysis using the AHP model to evaluate the importance of factors influencing entrepreneurship and identified key factors affecting the social entrepreneurial willingness of college students from both individual and university perspectives. Meanwhile, we introduced social environment as a moderating variable and analyzed its role in the generation of influencing factors and the willingness of college students to engage in social entrepreneurship.

First, based on the research results, we can conclude that entrepreneurial characteristics, entrepreneurial attitudes, and entrepreneurial support factors among college students have a positive impact on their social entrepreneurial willingness. This means that an individual's spirit of adventure, innovation, and independence plays an important role in driving their entrepreneurial willingness. This discovery emphasizes the importance of personal qualities and mindset in entrepreneurial decision-making.

Second, in terms of regulatory effect, we found that entrepreneurial intention has a positive regulatory effect on these factors. This means that entrepreneurial willingness can regulate the relationship between personal characteristics, entrepreneurial attitudes, and entrepreneurial support factors among college students, further influencing their social entrepreneurial willingness. This discovery reveals the mechanism by which entrepreneurial willingness plays a role in entrepreneurial decision-making, providing important clues for a deeper understanding of the social entrepreneurial willingness of college students.

Finally, this study established an evaluation index system for innovation and entrepreneurship education in universities through the AHP and proposed an implementation path, aiming to promote the development of innovation and entrepreneurship education in universities. By deepening education reform, optimizing curriculum design, strengthening team building, improving organizational efficiency, and creating a strong educational atmosphere, universities can more scientifically evaluate and improve the quality of innovation and entrepreneurship education, providing better support and guidance for cultivating students' entrepreneurial abilities.

Although this study conducted in-depth research on the influencing factors of entrepreneurship and proposed important conclusions about the social entrepreneurial willingness of college students, there are still some limitations that need to be clarified. For example, this study used the AHP model for quantitative analysis, which may have subjectivity and bias in certain situations. In the future, it is possible to consider introducing other quantitative and qualitative research methods, such as truthful surveys and interviews, to obtain more comprehensive and in-depth data and increase the reliability and accuracy of research results.

AUTHOR NOTE

Data availability: The figures used to support the findings of this study are included in the article.

Conflicts of interest: The author declares that there are no conflicts of interest.

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