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College Students' Entrepreneurial Intention and Personal Career Planning Based on Fuzzy Logic

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This study uses fuzzy logic analysis technology to explore the evaluation model of college students 'entrepreneurial intention and its application in personal career planning. By identifying the key factors affecting entrepreneurial intention, such as personal ability, intrinsic motivation, self-efficacy, social network, family background and educational environment, and using fuzzy logic modeling, this study constructs a comprehensive evaluation model of entrepreneurial intention. In addition, the model considers external conditions such as economic environment, policies and regulations, and industry dynamics, providing a comprehensive decision support system for college students. Through empirical research, this study verifies the validity of the model in predicting and guiding college students 'career planning. The model analyzes the degree of entrepreneurial intention and calculates the weight of influencing factors derived from the data collected via a questionnaire survey.

Keywords: entrepreneurial intention, fuzzy logic, college students, personal career planning

1. INTRODUCTION

With the rapid development of social economy, the widespread popularization of higher education has ushered in an era where college graduates pour into the labor market on an unprecedented scale, increasing the record number of new graduates year after year. The latest data from the National Bureau of Statistics clearly reveals this situation, demonstrating the widening gap between job demand and graduate supply, making "employment difficulty" an urgent social problem requiring attention [1]. This phenomenon is not only testing China'seducation system and employment structure; it also poses a potential threat to social stability and sustainable and healthy economic development, calling for innovative solutions. Against this macroeconomic background, entrepreneurship, as a new force, is gradually emerging and becoming an important means of alleviating employment pressure and activating the economic potential of the market. The government has responded positively and issued a series of support policies aimed at encouraging college students to join the tide of entrepreneurship and accelerating the optimization and upgrading of economic structure by cultivating emerging economic growth poles. This strategy not only sets up a broad stage for young students to realize their personal ambitions and dreams, but also injects continuous innovation power into social progress and the development of economic diversification [2]. Therefore, strengthening entrepreneurship education and cultivating students' risk assessment ability, innovative thinking and market adaptability have become the new focus of educational reform. At the same time, it is the common responsibility and mission of people in all walks of life to establish a perfect risk guarantee mechanism and entrepreneurship follow-up support system to reduce the failure rate of initial entrepreneurship and protect and stimulate college students 'entrepreneurial enthusiasm. As can be seen from Figure 1, the proportion of Class 2023 graduates choosing employment has increased, while the proportion choosing freelance employment, continuing study in China and entrepreneurship has decreased. The proportion

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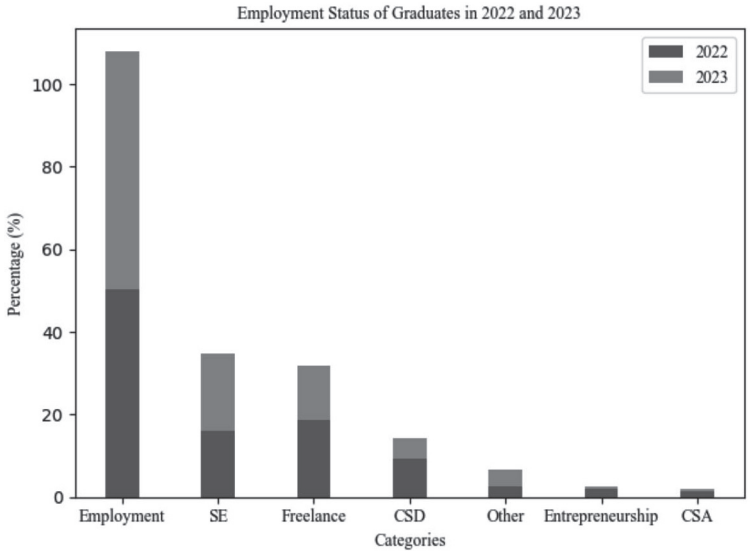

Figure 1 Employment dilemma 2022–2023.

of slow employment and other categories increased slightly. This may reflect changes in the job market, the impact of education policies, and the diversity of graduates' individual choices [3, 4].

At the theoretical level, entrepreneurial intention has been discussed for a long time. Theories such as the Theory of Planned Behavior (TPB) and Entrepreneurial Intent Theory attempt to reveal the psychological motivation and social factors influencing entrepreneurial behavior from different perspectives. Career planning theories, such as Schuber's career development theory and Saber's career development stage theory, emphasize the matching of personal interests, abilities and career environment, as well as the long-term and dynamic nature of career planning. In recent years, with the development of information technology, fuzzy logic, as a powerful tool for dealing with uncertainty and fuzzy information, has shown unique advantages in decision support systems and has been applied to entrepreneurial intention prediction and career planning [5]. The aim of this present study is to construct a set of models that can predict college students' entrepreneurial intention and provide personalized career path planning for individuals by means of fuzzy logic. The core objectives of this study are as follows: firstly, to analyze in depth the multiple factors affecting college students' entrepreneurial intention, and to construct a comprehensive evaluation model by using fuzzy logic method, so as to more accurately predict the entrepreneurial tendency of students with different backgrounds; secondly, to explore the application potential of fuzzy logic in career planning, and to provide dynamic and flexible employment or entrepreneurial path suggestions for students by quantifying multiple factors such as personal interest, ability and market demand. The theoretical contribution of this study lies in its integration of the existing theories of entrepreneurial intention and career planning, introducing innovative applications of fuzzy logic in order to enrich the theoretical system of related fields. The practical value is that it provides scientific basis for college career guidance and government policy formulation, helping college students to make employment or entrepreneurship choices that are more in line with their own personal traits and the market demands, thus improving the quality of employment and promoting the healthy development of social economy.

2. RELATED RESEARCH

2.1 Theoretical Framework

This section explains in more detail the theoretical foundation of this study, and provides a more comprehensive theoretical support for the development of fuzzy logic model by integrating the theories closely related to college students 'entrepreneurial intention and personal career planning.

The framework of the original theory of planned behavior (TPB) [6] is shown in Figure 2. Recent studies have enriched and perfected it [7]. In the field of entrepreneurship, the TPB model is further refined, and entrepreneurs' risk perception and ability to recognize opportunities are proposed as additional influencing factors, which are important in predicting entrepreneurial behavior intention. In addition, Lesinskis et al. [8] verifies the universal applicability of TPB in explaining entrepreneurial intention in different cultural backgrounds through cross-cultural research, which provides cross-cultural theoretical support for this study.

Career Construction Theory (LCT) has gradually become one of the core theories in the field of career guidance and career planning [9]. Recently, Flanagan and Palmer [10] emphasize the initiative and creative problem-solving ability of individuals in career construction by introducing "career design thinking", which better enables college students to position their roles in the complex and changeable employment market. At the same time, Burnette et al. [11], by combining the dynamics of career construction with life stage theory, provide a theoretical framework for the way that individuals plan their careers adaptively at different career stages.

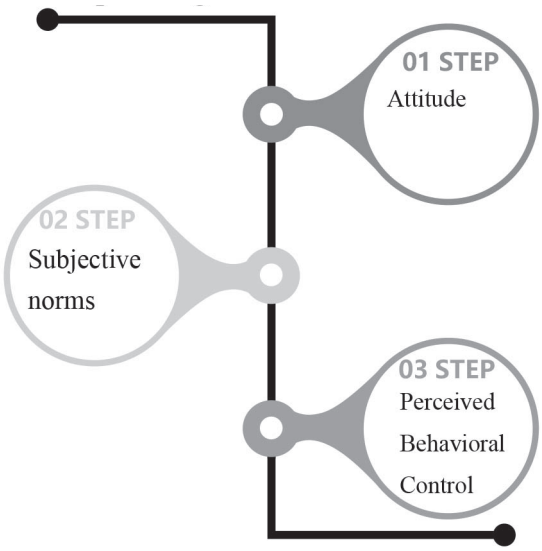

Figure 2 Theory of Planned Behavior (TPB) framework.

Fuzzy logic, as a powerful tool for dealing with complexity and uncertainty, is becoming increasingly important in theory and practice, especially when faced with highly subjective decision-making problems such as entrepreneurial intention analysis and career planning. Since Uskuri and Sesen's [12] pioneering work, the foundations of fuzzy logic have been laid, followed by Palmer et al. 's [13] intuitionistic fuzzy set theory, which introduces new dimensions into the field, making subjective judgment and preference quantification a reality, which is particularly critical in explaining and quantifying individuals' fuzzy attitudes towards entrepreneurial intentions and career choices [14]. The contribution of the paper extends the theoretical boundary of fuzzy logic, and also provides theoretical support for the means of capturing the nuances of human decision-making in fuzzy concepts [15]. The breakthrough in the field of fuzzy decision theory provides a new theoretical framework for multi-objective and multi-criterion decision analysis in career planning, and greatly enriches the application scenarios of fuzzy logic. The framework comprehensively considers multiple conflicting goals in the face of a fuzzy environment, and offers quantitative support for personal preference ranking and decision-making. This provides solid theoretical guidance for the construction and application of our fuzzy logic model, making the model more detailed and comprehensive in dealing with entrepreneurial intention prediction and career planning.

2.2 A Study on College Students' Entrepreneurial Intention

In recent years, the study of college students 'entrepreneurial intention has become the focus of education, psychology and management science, attracting strong attention from extensive academic circles. From multiple perspectives, scholars have analyzed in depth the internal psychological motivation and external environmental conditions that affect college students' entrepreneurial intention, aiming to establish a comprehensive entrepreneurial intention map. A study conducted among Chinese college students [16] strongly revealed that personal traits, especially self-efficacy, risk-taking tendency and innovative thinking, have significant positive driving effects on entrepreneurial intention. This finding aligns with the entrepreneurial trait theory proposed by Blaese et al. [17] which emphasizes the decisive role of individual characteristics in the entrepreneurial decision-making process. At the same time, external factors also play an important role, social and cultural background of entrepreneurial intention to shape the power cannot be underestimated [18]. According to their entrepreneurial opportunity theory, the dynamic environment provides a stage for individuals to identify and grasp business opportunities. This theoretical framework provides an important basis for understanding how external factors promote entrepreneurship.

Accessibility of policy and educational resources is also one of the key factors affecting entrepreneurial willingness [19]. Data from the study demonstrate that easily accessible policy support and high-quality educational resources significantly increase college students 'entrepreneurial propensity, further underscoring the importance of external support mechanisms. In addition, the influence of family background and social networks cannot be ignored [20]. The social capital theory of [2] highlights the positive role of social networks in entrepreneurial activities, and further points out that emotional encouragement and experience sharing from family and friends play a key role in enhancing college students 'entrepreneurial confidence, highlighting the positive role of social capital. Gender differences in entrepreneurial intention also show unique patterns [5]. Although female participation in entrepreneurship is increasing, male college students still show a higher trend in entrepreneurial intention, which is partly attributed to social role expectations and cultural cognitive frameworks. However, the study [2] found that gender differences tended to decrease after controlling for variables such as education level and family background, suggesting that the explanation of gender differences needs to be considered more carefully and take into account the interaction of multiple factors and situational determinants.

2.3 Current Status of Personal Career Planning

With the acceleration of economic globalization and technological advancements, the study of personal career planning has changed from the traditional linear model to dynamic adjustment strategy in order to adapt to complex and dynamic environments [21]. The theory of career development emphasizes the lifelong nature of career planning, and proposes a career rainbow diagram, which points out the career tasks and role changes of individuals at different stages of their lives, and lays a foundation for understanding the nonlinear process of career development.

In recent years, the rise of career construction theory [22] has promoted the development of career planning so that more attention is being paid to individual subjective initiative and situational adaptability [4]. Emphasizing career storytelling to facilitate the construction and reconstruction of individual self-identity, this perspective encourages individuals to actively explore and adjust career paths in the face of uncertainty rather than passively adapt to external changes. Technological advances have had a profound impact on career planning [23]. This paper discusses the application of artificial intelligence in career guidance, and points out that through big data analysis and machine learning technology, more personalized career matching and career development suggestions can be provided for individuals, indicating that career planning is gradually being integrated into the digital and intelligent trend. In addition, cross-cultural career development has become a new research hot spot [24], exploring the impact of different cultural values and economic conditions on career planning in the context of globalization, and how to achieve career success in a multicultural environment. These studies highlight the complexity and diversity of career planning in an international context and place new demands on developing global competencies. To sum up, the current personal career planning research has evolved from static to dynamic, from single to multiple, from standardization to individualization, from localization to internationalization, reflecting that in a rapidly changing world, individuals need to continuously improve their self-planning and adaptability so as to cope with future uncertainties.

3. FUZZY LOGIC ANALYSIS OF COLLEGE STUDENTS' ENTREPRENEURIAL INTENTION

3.1 Identification of Influencing Factors

The formation of entrepreneurial intention is a complex process involving psychological and social factors. This section summarizes the key factors affecting the entrepreneurial intention of college students and provides a basis for subsequent fuzzy logic modeling. Based on previous studies [25], this study identified the core influencing factors shown in Table 1.

Table 1 details the key factors affecting college students' entrepreneurial intention, as well as their definitions, examples of measurement indicators, and brief descriptions. These factors are divided into three categories: personal traits, environmental factors and external conditions, and each category contains a number of specific factors. The personal trait category comprises personal ability, intrinsic motivation and self-efficacy, which directly reflect the actual ability and motivation of individuals in entrepreneurial action. The environmental factors category comprises social networks, family background and educational environment, which are critical for identifying entrepreneurial opportunities and accessing resources. Factors in the external conditions category include economic environment, policies and regulations, and industry dynamics, which directly affect the feasibility and opportunity of entrepreneurship. By identifying these key factors, this study can understand and evaluate college students 'entrepreneurial intention more comprehensively, and provide a basis for subsequent fuzzy logic modeling.

3.2 Model Construction

In this section, we build a fuzzy logic-based evaluation model of college students' entrepreneurial intention. Its framework is shown in Figure 3. Firstly, the fuzzy set definition of each influencing factor is clarified, and the corresponding membership function is set to quantify the entrepreneurial intention of college students according to each dimension. Let be the set of influencing factors, which represents the ith factor (such as personal ability, social network, etc.). For each factor, we define a fuzzy set, where is the domain of discussion of the factor and is the membership function, reflecting the degree of belonging of x on, as shown in Equation (1).

$$\widehat{f_i} = (x, \mu_{f_i}(x)) | x \in X_i, \mu_{f_i}(x) \in [0, 1] \tag{1}$$

$\widehat{f_i}$ is the i-th influencing factor,personal ability, social network.

X_i is the domain of the factor $\widehat{f_i}$ the possible range of values for personal ability, from low to high.

$(\mu_{f_i}(x))$ is the membership function that defines the degree to which x belongs to the fuzzy set for $\widehat{f_i}$, with values between 0 and 1.

This formula describes how each influencing factor is represented as a fuzzy set, with $(\mu_{f_i}(x))$ quantifying the degree of influence or membership for each factor $\widehat{f_i}$. Social network strength (SN) uses Gaussian curve membership function to reflect the strength of Social networks: where, the steepness of the control curve is the threshold at which network influence begins to appear [26, 27], as shown in Equation (2):

$$\mu_{SN}(x) = \begin{cases} 0, & x \le a_{SN} \\ \frac{1}{1+e^{-k_{SN}(x-a_{SN})}}, & x > a_{SN} \end{cases} \tag{2}$$

Family background FB is represented by an S-curve membership function, which indicates the positive influence of family support and economic conditions, as shown in Equation (3):

$$\mu_{FB}(x) = \frac{1}{1 + \left(\frac{x}{c_{FB}} a_{FB}\right)^2} \tag{3}$$

Table 1 Classification of factors influencing college students' entrepreneurial intention.

Factor category	Factor name	Defined	Examples of measurement indicators	Brief description
Personal traits	personal ability	Covers professional skills, leadership, innovative thinking and more	Professional certificates, team leadership experience, innovative project participation	The skills and abilities mastered by individuals directly affect the implementation of entrepreneurial actions
	intrinsic motivation	The intrinsic drive of individuals to start businesses	Entrepreneurial enthusiasm, achievement motivation scale score	Personal desire for success and inner motivation for entrepreneurship
	self-efficacy	Confidence in completing specific tasks	General self-efficacy scale	Individual confidence level in their entrepreneurial success
Environmental factors	social network	Personal owned social resources and support	Size of circle of friends, number of industry contacts	Network resources are critical to entrepreneurial opportunity identification and resource acquisition
	family background	Economic situation, family support for entrepreneurship	Family income level, family business experience	The Influence of Family Economy and Culture on Entrepreneurship View
	educational environment	Education and training received	Entrepreneurship course participation, internship experience	The accumulation of entrepreneurial knowledge and skills through learning experience
External conditions	economic environment	Market demand, difficulty in obtaining funds	GDP growth rate, venture capital index	Economic climate directly affects entrepreneurial costs and opportunities
	policies and regulations	Entrepreneurship Support Policy	Tax breaks, start-up subsidies	Government incentives help start-ups
	industry dynamics	Industry trends and competitive conditions	Emerging industry growth rate, market saturation	Industry characteristics affect the feasibility and potential of entrepreneurship

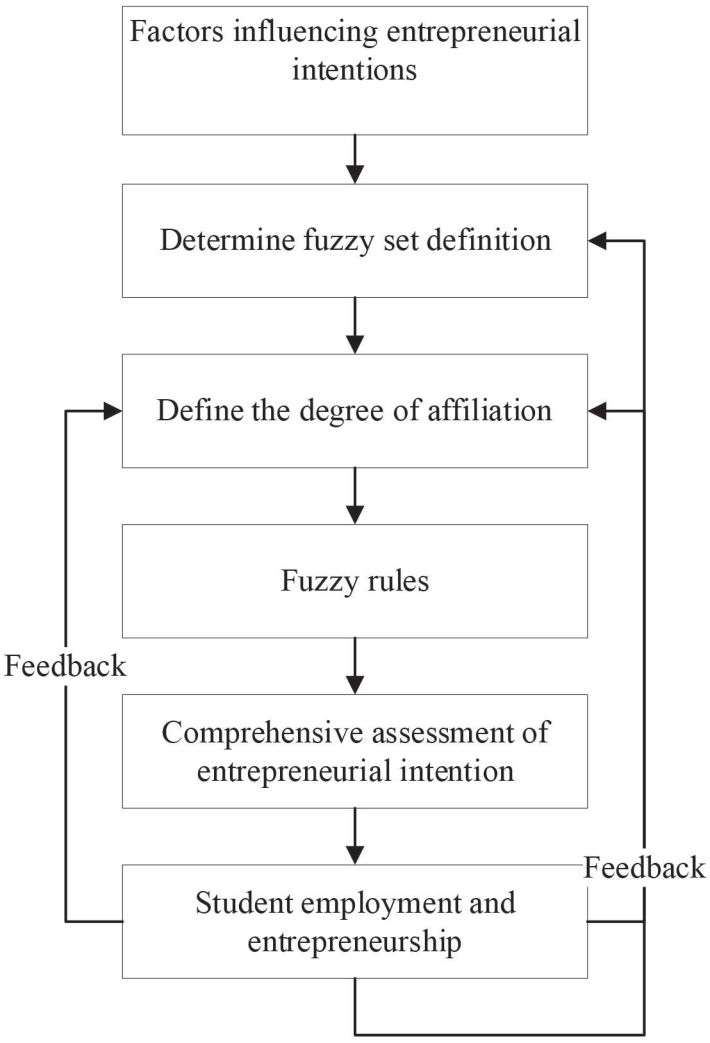

Figure 3 Evaluation model of college students' entrepreneurial intention based on fuzzy logic.

Among them, controlling the center position of the curve affects the width of the curve, reflecting the positive influence of family background on the degree of entrepreneurial support: c_{FB} a_{FB}. By means of these diverse membership function examples, we can better describe the degree of influence of each factor on college students' entrepreneurial intention, and ensure the comprehensiveness and accuracy of the model.

Based on fuzzy sets and membership functions, we construct fuzzy rules to evaluate entrepreneurial intention. Fuzzy rules indicate the logical relationship among factors and the comprehensive influence on entrepreneurial intention. For example, for IF personal ability IS high AND social network IS strong THEN entrepreneurial intention IS very likely. This rule can be formalized as: where, respectively correspond to the membership function of "high", "strong" and "very likely". Using these rules, we can integrate the fuzzy evaluation of each factor into the fuzzy evaluation of the overall entrepreneurial intention [28], as shown in Equation (4):

$$\mu_{f_i}([\mu_{\mathrm{EI}} = \min(\mu_{\mathrm{PA}}(\mathrm{high}), \mu_{\mathrm{SN}}(\mathrm{strong}))]) \tag{4}$$

μ_{EI} represents the membership function of entrepreneurial intention.

μ_{PA}(high) is the meme hip function for personal ability being "high."

μ_{SN}(strong) is the membership function for social network being "strong."

We adopt fuzzy logic reasoning, in particular the principle of maximum membership degree, to synthesize the fuzzy evaluation results of each factor and obtain the comprehensive evaluation of entrepreneurial intention. The specific steps are: (1) apply fuzzy logic AND operation in antecedent to each fuzzy rule; (2) apply fuzzy set operation (such as maximum membership degree) in consequent to determine the final entrepreneurial intention membership function; (3) obtain the final entrepreneurial intention evaluation by calculating the gravity center or maximum membership degree of the whole entrepreneurial intention fuzzy set. The membership function of the final entrepreneurial intention EI (x) can be calculated by assuming that there are n rules, as shown in Equation (5):

$$\mu_{EI}(x) = \frac{\sum_{i=1}^{n} w_i \cdot \mu_{R_i}(x)}{\sum_{i=1}^{n} w_i} \tag{5}$$

where is the weight of the ith rule, which can be determined by expert judgment or statistical analysis, and is the degree of membership of the subsequent part of the ith rule on x [29, 30], as shown in Equation (6):

Table 2 Weight analysis results.

Influencing factors	Weight value
Personal ability	0.35
Social network	0.28
Risk attitude	0.22
Entrepreneurship education experience	0.15
Family background	0.05

$$w_i \cdot \mu_{R_i}(x) \tag{6}$$

This represents the weight w_i of the i-th rule and the degree of membership $\mu_{R_i}(x)$for the i-th rule on x.

3.3 Empirical Study

This section explains in detail the process of questionnaire implementation, data collection and analysis, in order to determine the degree of college students' entrepreneurial intention and analyze the weight of influencing factors. The survey design was based on several previously established key factors, including personal abilities, social networks, risk attitudes, entrepreneurial education experience, and family background.

A total of 1,500 questionnaires were distributed via online and offline platforms, and 1,000 valid questionnaires were obtained, covering college students from different regions and types, ensuring the representativeness and diversity of the sample [31]. Data preprocessing included data cleaning, missing value processing (mean filling method) and the conversion of scale data into membership degrees of fuzzy sets for subsequent analysis. The fuzzy logic model was used to evaluate the entrepreneurial intention of college students comprehensively, and the relative importance of each factor in decision-making is clarified by calculating the weight of each factor. Table 2 shows the weight analysis results of influencing factors.

As shown in Table 2, personal ability ranks first among the influencing factors with the highest weight of 0.35, emphasizing the important role of professional skills, leadership and innovation ability in promoting college students' entrepreneurial intention. Next, the social network weight of 0.28 reveals that strong interpersonal relationships and social resources are indispensable for identifying entrepreneurial opportunities and obtaining necessary support. In contrast, a weight of 0.2 for risk-taking propensity indicates that while willingness to face uncertainty is a component of entrepreneurial decision making, its influence is less significant than that of individual abilities and social networks. For entrepreneurial education experience and family background, the ratio was 0.15 and 0.05 respectively, indicating that although these factors contributed to entrepreneurial intention, they played a relatively minor role overall. Specifically, the long-term value of entrepreneurial education experience, although not directly reflected, has a subtle impact on students' entrepreneurial readiness; and the complexity and variability of family background had different effects on different individuals' entrepreneurial intentions, showing a high degree of personal differences.

4. FUZZY DECISION SUPPORT FOR PERSONAL CAREER PLANNING

4.1 Fuzzy Decision Support

Personal career planning is a complex process that involves a comprehensive consideration of both personal internal characteristics and external environmental conditions. To make better decisions, fuzzy decision support models are employed to integrate multiple uncertainties, providing flexible and robust recommendations.Intrinsic personal traits, such as interest, can be either quantitative or qualitative. These traits can be expressed using categories such as {low, medium, high}. On the other hand, external environmental conditions, like market demand, can also be quantitative or qualitative and may be expressed as {weak, medium, strong}.

For each of these factors, we define fuzzy sets and determine their membership functions. A high degree of interest, for example, can be modeled using a bell-shaped function, where the center of the bell-shaped curve controls the width of the function. Similarly, for other factors, appropriate membership functions can be determined to reflect the degree of influence or membership each factor holds within its category.By employing fuzzy decision support, the model quantifies these subjective characteristics, thereby aiding in more precise and personalized career recommendations.As shown in Equations (7):

$$\mu_{A_j}(x) = \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right) \tag{7}$$

These rules can be expressed in terms of fuzzy logic as Equations (8) and (9).

$$R_1\text{: IF } i_j \text{ IS } A_j \text{ AND } e_k \text{IS } B_k \quad \text{THEN Recommend venture} \tag{8}$$

$$R_2 \text{ IF } i_j \text{ IS } A_j' \text{ AND } e_k \text{ IS } B_k' \quad \text{THEN Recommend employment} \tag{9}$$

We use Mamdani inference to calculate the fitness (activation strength) of each rule: $\alpha(R_1) = \min(\mu_{A_j}(i_j), \mu_{B_k}(e_k))$, $\alpha(R_2) = \min(\mu_{A_j'}(i_j), \mu_{B_k'}(e_k))$. Then we determine the conclusion of each rule: Finally, we use centroid to defuzzify and calculate the recommendation index. Using these steps and formulas, we construct a fuzzy decision support model for personal career planning that takes into account the individual's intrinsic traits and external environmental conditions to provide guidance on entrepreneurship or employment, as shown in Equations (10) and (11).

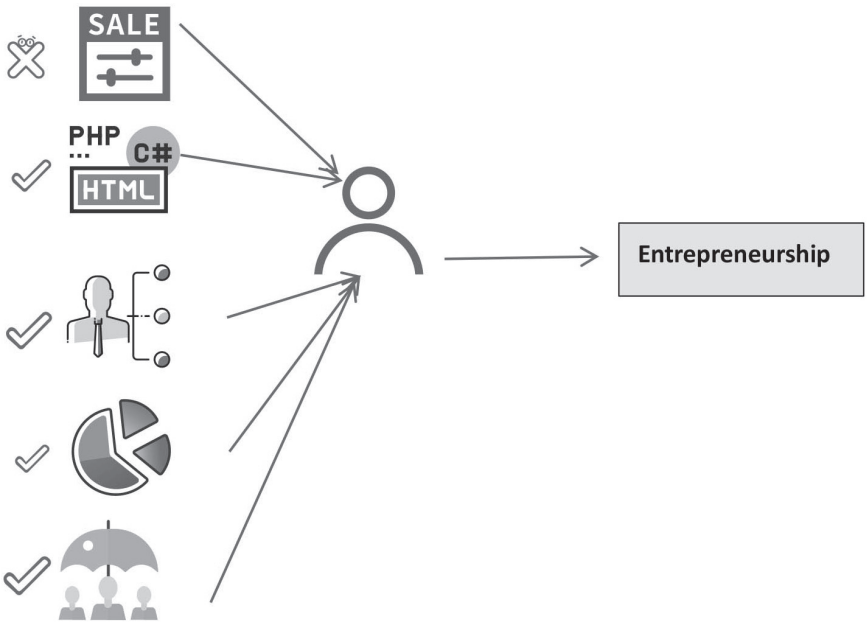

Figure 4 Decision causality diagram.

$$C(R_2) = \alpha(R_2) \cdot \text{Recommend unemployment} \tag{10}$$

$$\text{Recommend Index} = \frac{\sum \alpha(R_i) \cdot C(R_i)}{\sum \alpha(R_i)} \tag{11}$$

4.2 Case Analysis

Li Ming, a graduating computer science major, wants personalized advice on whether to get a job or start a business as he is unsure about his future career path. We use the fuzzy decision model constructed earlier to provide decision support for Li Ming, taking into consideration his personal interests, skill level, market trends and economic conditions. The causal diagram of his decision is shown in Figure 4.

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Personal Interest I: Li Ming has a high enthusiasm for programming (set interest value of 90 points, in the high interest range), but is generally interested in management affairs (50 points). Therefore, we set the threshold for fuzzy sets of interest as: ($a_I = 50, b_I = 60, c_I = 80, d_I = 90$).

Skill Level S: In programming skills, Li Ming has a strong ability after many struggles (set the skill value as 85 points, which is a high level). The threshold for skill fuzzy sets is set to: ($a_S = 60, b_S = 60, c_S = 80, d_S = 90$).

Market Trends M: Currently, the IT industry has a high demand for software developers, and the startup environment is also conducive to technology innovation (Market Trends score of 75 points, set threshold as: ($a_M = 50$, $b_M = 60$, $c_M = 70, d_M = 80$).

Economic Condition E: Li Ming's family is financially stable and can provide him with certain start-up capital (score of economic condition is 70, set threshold value as: ($a_E = 60$, $b_E = 60, c_E = 80, d_E = 90$).

The fuzzy rules are set up as follows:

(1) If interest is high and skill level is high, recommend entrepreneurship: $\theta_m = 80, \theta_s = 70$.

(2) If market trends are good and economic conditions permit, entrepreneurship is encouraged: $\theta_m = 80$, $\theta_s = 80$.

According to the membership function, the first membership degree (because 90 is located in the interest high complete membership area), the second membership degree (the same as above, located in the skill high complete membership area), market trend membership degree (located in the trend high complete membership area), and economic condition membership degree (located in the economic condition allowable complete membership area) are calculated as:$\mu_I(90) = 1$, $\mu_S(85) = 1, \mu_M(75) = 1, \mu_E(70) = 1$.

Then, the final decision is determined by the maximum membership principle, as shown in Equation (12):

$$\mu_{\text{Entrepreneurship}} = \max(\mu_I(90),\ \mu_S(85),\ \mu_M(75),\ \mu_E(70)) \tag{12}$$

Thus,this determine Li Ming's suitability for "Recommended Entrepreneurship." Using the maximum membership principle, the final evaluation strongly recommends entrepreneurship for Li Ming.

According to the above settings, we determine Li Ming's suitability for "Recommended Entrepreneurship". Using the maximum membership principle, we find that Li Ming exceeds the threshold in terms of interest and skill; furthermore, the market trends and economic conditions also support entrepreneurship. Therefore, the final fuzzy inference results strongly recommend that Li Ming consider the entrepreneurial path.

4.3 Model Linkage

The evaluation results of the entrepreneurial intention model play a crucial role in the decision-making model. As input data, they provide valuable information about individual entrepreneurial intention to the model. Through iterative feedback and optimization of these results, the decision model can more accurately capture changes in the personal characteristics of individuals, and the external environment, thus ensuring that its recommendations are more in line with the actual situation of individuals and can reflect market dynamics in a timely manner.

This dynamic adjustment mechanism enables the decision-making model to adapt flexibly to changing environments and provide timely and effective career planning suggestions for individuals. The seamless transition from entrepreneurial intention to career planning not only improves the clarity of career development paths, but also enhances individuals' adaptability to uncertainty and market fluctuations.

Through continuous iteration and optimization, decision models can gradually improve the accuracy of their predictions and the usefulness of their recommendations, helping individuals make more informed decisions in regard to difficult career choices. The system design ensures that individual career planning is dynamic and forward-looking, enabling individuals to adjust their career development direction based on real-time data and trend analysis to maximize long-term career goals and career success.

5. EXPERIMENTAL EVALUATION

In order to verify the validity and practicability of the fuzzy logic model in prediction and practice guidance, we selected 100 college students with diverse subject backgrounds and geographical representation as research subjects. Using advanced fuzzy logic models, we tracked and analyzed the entrepreneurial intentions of these students over three years, aiming to accurately predict their future career path choices. During this period, we continued to collect detailed personal data after the first, second, and third years in order to scientifically compare the predicted entrepreneurial intentions of students with the success rates after they engaged in entrepreneurial activities. This process involved the rigorous testing of the model's prediction accuracy, and also determined whether the model is effective in assisting students to make the most appropriate entrepreneurial or employment decisions based on their personal characteristics and market dynamics. The execution flow is shown in Figure 5.

5.1 Career Planning Effectiveness

Table 3 shows the predicted probability of entrepreneurial intention, the number of entrepreneurs, and the entrepreneurial success rate for three consecutive years. As can be seen from the table, with the increase of years, the probability of predicting entrepreneurial intention increases year by year, from 0.23 in 1 year to 0.35 after 3 years. The number of entrepreneurs also increases year by year, going from 26 to 35.

Table 4 shows gender differences in regarding the probability of entrepreneurial intention and entrepreneurial success among liberal arts and engineering students. The data show that the probability of male entrepreneurial intention in the liberal arts and engineering departments is higher than that of female, with the probability of male entrepreneurial intention in the liberal arts department being the highest, reaching 0.38. In terms of entrepreneurial success rate, men in the engineering department perform better than those in liberal arts by 10 percentage points. While the success rate for women in liberal arts is 15 per cent, it is assumed that the success rate for women in engineering may be lower than this figure, although specific data for engineering are not available.

Table 5 shows the average satisfaction with entrepreneurship and employment over three consecutive years. It can be seen that the average entrepreneurial satisfaction has increased year by year, from 4.2/5 in one year to 4.6/5 after three years, indicating that entrepreneurs' satisfaction with entrepreneurship is constantly improving. Similarly, average job satisfaction increased, albeit by a smaller margin, from 3.8/5 in one year to 4.3/5 after three years. This suggests that entrepreneurship may have provided higher levels of satisfaction over the same period.

Table 6 shows the changes in entrepreneurship and employment satisfaction at different stages after the application of the model. After initial planning, entrepreneurship and employment satisfaction increased significantly, increasing by 0.3/5 respectively. After adjusting for one year and then after two years, the change in satisfaction decreased, but still showed positive growth.

5.2 Comprehensive Discussion

Entrepreneurship and traditional employment are not two parallel lines in isolation; they are intertwined in personal career planning. The entrepreneurial path attracts innovative and adventurous individuals with its high risk, high reward and autonomy, while traditional employment attracts students who pursue security and structured development with its stability and clear promotion mechanism. Fuzzy logic model plays a bridge role here. By quantifying personal ability, market trend, risk preference and other dimensions, the model can dynamically evaluate the suitability of individuals for one of the two career paths, and facilitate more personalized and flexible decision-making. Fuzzy logic analysis reveals the mechanism of mutual influence between paths. For example, even if the entrepreneurial experience is unsuccessful, the leadership and problem-solving skills accumulated in the process can be transferred to the traditional workplace to accelerate promotion. Similarly, individuals with rich workplace experience have strong insight into the industry and can grasp the market demand more accurately when turning to entrepreneurship. By capturing these mutual advantages, the model guides students to switch or merge strategies between the two paths in time to seek the optimal development path. The fuzzy logic model emphasizes dynamic adjustment. Market changes, personal growth, family responsibilities and other variables evolve over time, and the model reminds

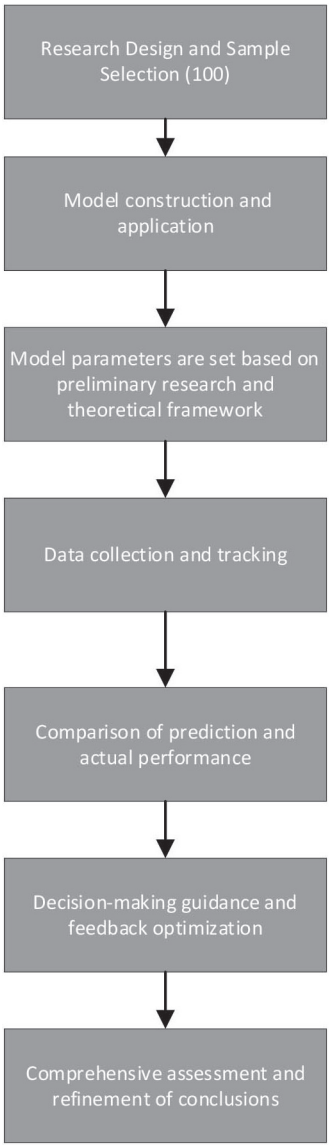

Figure 5 Execution flow.

Table 3 Comparative analysis of year and entrepreneurship.

Year	Predicting entrepreneurial intention probability	Number of entrepreneurs	Success rate of entrepreneurship
1 year	0.23	26	18%
2 years	0.28	28	32%
3 years	0.35	35	45%

Table 4 Comparative analysis of gender, discipline and entrepreneurship.

Factors	Probability of entrepreneurial intention in liberal arts department	Probability of entrepreneurial intention in engineering department	entrepreneurial intention probability difference	Business Success Rate of Liberal Arts Department	Success rate of entrepreneurship in engineering department	Difference in entrepreneurial success rate
Male	0.38	0.25	Male sex differences	20%	30%	10%
Women	0.32	0.20	Female sex differences	15%	26%	11%

Table 5 Comparative analysis of year and average satisfaction.

Year	Average entrepreneurial satisfaction	Average employment satisfaction
1 year	4.2/5	3.8/5
2 years	4.5/5	4.1/5
3 years	4.6/5	4.3/5

Table 6 Analysis of model application and satisfaction change.

Model-application phase	Change in entrepreneurial satisfaction	Changes in job satisfaction
After initial planning	+0.3/5	+0.3/5
Adjustment after 1 Year	+0.1/5	+0.3/5
Adjust after 2 years	+0.05/5	+0.2/5

career planning that it is not static, but needs to be reviewed periodically to optimize strategies using new data. For example, individuals initially suitable for employment, three years later, as new market opportunities or personal skills improve, the model re-evaluates the probability of entrepreneurship, prompting timely adjustment of planning, and vice versa.

6. CONCLUSION

This study offers an effective decision support system for career planning by conducting a fuzzy logic analysis of college students 'entrepreneurial intention. The fuzzy logic model can comprehensively consider the personal characteristics of individuals, and their external environment, thus providing and provide college students with guidance in regard to entrepreneurship or employment. The empirical results show that personal ability, social networking, risk attitude and entrepreneurial education experience are the main factors affecting college students 'entrepreneurial intention. The weight analysis of these factors reveals their relative importance in decision-making and provides personalized career planning suggestions for college students. Moreover, the dynamic adjustment mechanism of the model enables it to adapt flexibly to changing environments and provide timely and effective career planning suggestions for individuals. Through continuous iteration and optimization, decision models can gradually improve the accuracy of their predictions and the usefulness of their recommendations, helping individuals make more informed decisions in regard to difficult career choices. In general, this study used fuzzy logic analysis technology to provide personalized career planning suggestions for college students, assisting them to better cope with uncertainty when making a career choice.

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