Evaluation of Nationwide Enterprise-Starting Environment Based on Consistent Fuzzy Preference Relations: A Case Study of Daqing City

Jin Wang[*], Xiangyi Lin, Shuhui Tian

School of Economics and Management, Northeast Petroleum University, Daqing, Heilongjiang, 163318 China
[*]Corresponding author. Email: dqwangjin@126.com

ABSTRACT

Nationwide enterprise-starting is an effective way to promote employment under a new economic challenge where an oil city's resources is coming depleted. We use Likert 5-scale tool to evaluation index system and incorporate the Fuzzy consistent preference relationship to assess the nationwide entrepreneurial environment. The study foundation for optimizing the nationwide entrepreneurial environment and improving sustainable economy. According to the evaluation methodology of nationwide entrepreneurial environment, we identify and analyse five nationwide entrepreneurial environment elements including economic, cultural, service, natural and infrastructure, and scientific and technological innovation environments. This article aims to find the key factors that may affect the national entrepreneurial environment of Daqing through data evaluation, and provide a basis for optimizing the national entrepreneurial environment of Daqing and promoting the sustainable economic development of Daqing.

Keywords: Nationwide, entrepreneurial Environment, fuzzy consistent preference relationship

1. INTRODUCTION

Under the new economic circumstance, China's economic growth rate has been shifted from a high-speed to a medium-high speed accompanying nationally due to weakened market demand, over supplied the primary and secondary industries and reduced global economic growth. The employment pressure has become increasingly serious. The approach of nationwide enterprise-starting is great significance for maintaining social stability and promoting sustainable economic development. Entrepreneurial environment is a key factor that affects nationwide enterprise-starting activities and services. It has a fundamental role in promoting nationwide enterprise-starting activities as well as profoundly affects the initiative of potential entrepreneurs to join entrepreneurial activities. This pave the way of successfully promoting entrepreneurial activities as Xiao Li suggested [1]. Creating a good nationwide entrepreneurial environment is not only the fundamental condition for accelerating urban economic development, but also an important indicator of a city's core competitiveness and potential development capability. Zhao, Zhu and Li's study [2] demonstrates that evaluation of the nationwide entrepreneurial environment is urgent research for recognizing and understanding those important aspects. To create an attractive nationwide entrepreneurial environment, it is necessary to establish a scientific nationwide entrepreneurial environment evaluation index system, which is based on the realistic situation of the city, by adopting appropriate evaluation methods, eg. Likert 5-scale tool in this study. After identify and sort out the various impact factors that make up the entrepreneurial environment for investors, we are able to select those that have greater impact. Those will be the focus of the improvement. By distinguishing the primary and secondary contributing factors and target, we could set the strategy to improve the efficiency, as well as optimizing the nationwide entrepreneurial environment. As the final aim, we can build an incubator for entrepreneurs' business success and the local can attract more entrepreneurs' investment.

2. THEORETICAL SECTION

2.1. Definition of Entrepreneurial Environment

Academia define the entrepreneurial environment based on collective perspectives. More representatively accepted one is proposed by the London Business School in the United Kingdom and the Berson Business School in the United States. They jointly proposed that the entrepreneurial environment refers to financial institution support, government support policies, government-led projects, education and training, transformation of scientific research achievements, business infrastructure, market freedom, culture and social norms which have a significant impact on entrepreneurial activities [3]. Pertaining to Chinese economic field, Yao and Long [4] proposed that the entrepreneurial environment is the sum

of various environmental factors including natural environmental factors and social environmental factors related to entrepreneurship. The optimization of the entrepreneurial environment should take into account the aspects of interrelated economics and sociology during those analysis and research. Wang proposes that the entrepreneurial environment refers to the public platform for entrepreneurs who relies on to create new enterprises which including scope of activities, regions as well as situations and circumstances faced by entrepreneurs [5].

2.2. Influencing Factors of the Nationwide Entrepreneurial Environment

There are many influencing factors for the nationwide entrepreneurial environment. Chinese scholars elaborate and analyze the influencing factors for the nationwide entrepreneurial environment in Chinese economic system. Xu[6] supports that the study of the influencing factors of the nationwide entrepreneurial environment should focus on the legal policy environment, financial and economic factors, government service levels, and intellectual support for intelligence.

By emphasizing the perspective of the key characteristics of creating new enterprises, Chen and Chen [7] proposes that the nationwide entrepreneurial environment should be divided into four aspects: financial and non-financial support, socioeconomic status, entrepreneurship and management capabilities, government entrepreneurship policies and working procedures.

Zhang and Zhu [8] propose that the influencing factors of the nationwide entrepreneurial environment include the annual per capita disposable income of urban residents, the amount of nationwide entrepreneurial projects, the unemployment rate of local residents, the number of high-tech innovation employees, the operating income of high-tech and innovative entrepreneurs, the turnover of the technology market, population of the permanent residents, the portion of students with higher education per 100,000 population, the expenditure on innovative product research and development, etc.. All these factors can be divided into two categories as driving factors and characteristic factors which depend on the specific conditions of individual cities.

In this paper, authors propose and studies a set of five influencing factors of the nationwide entrepreneurial environment mainly including economic environment, cultural environment, service environment, natural and infrastructure environment and technological innovation surroundings.

3. THEORETICAL SECTION

Using the definition of entrepreneurial environment and identified impact factors of the nationwide entrepreneurial environment, we use the Likert scale 5-level scale method to design the nationwide entrepreneurial environment evaluation system index screening questionnaire. The scale levels representing the degree of influence of various indicators on the nationwide entrepreneurial environment are assigned below as shown in Table 1.

In order to ensure the reliability of the index screening of the nationwide entrepreneurial environment evaluation system, the survey sample should be comprehensive. The phase I research survey conducted in this article includes 15 experts and scholars working in entrepreneurship research and the personnel in charge of the Employment Guidance Center who are from Harbin Institute of Technology, Harbin Engineering University, Heilongjiang University, Northeast Petroleum University, Heilongjiang Bayi Agricultural University; 30 staff members from Daqing Human Resources and Social Security Bureau and Entrepreneurship Incubation Center; and 55 entrepreneurs. A total of 100 questionnaires were sent out, 93 were returned, 91 questionnaires were valid, 2 questionnaires were invalid, and the effective questionnaire rate was 91%. The questionnaire data will be assigned in the nationwide entrepreneurial environment evaluation index system as listed in Table 2.

4. EVALUATION OF THE NATIONWIDE ENTREPRENEURIAL ENVIRONMENT

In this paper, the fuzzy consistent preference relation model is used to calculate the index weight of the nationwide entrepreneurial environment system which is described as below sections.

Table 1 Description of 5-point likert-type scale

Very weak	Weak	Average	Strong	Very strong
1	2	3	4	5

Table 2 The probability value of National Entrepreneurship Environment in Daqing

First-level indicators	Second-level indicators	Third-level indicators	Third-level indicators' relative significance
Economic environment (A)	Economy aggregate(A_1)	GDP(A_{11})	0.0201
		tax revenue(A_{12})	0.0379
		Local fiscal revenue(A_{13})	0.0290
	Market capacity(A_2)	Per capita disposable income(A_{21})	0.0326
		Deposit balance per capita(A_{22})	0.0219
		Per capita retail sales(A_{23})	0.0156
	Economic structure(A_3)	tertiary industry contribution to GDP (A_{31})	0.0201
		Employment ratio from tertiary industry(A_{32})	0.0244
		Urban Industry Innovation and Entrepreneurship Index(A_{33})	0.0198
Cultural environment (B)	faithfulness and ethics(B_1)	Integrity atmosphere(B_{11})	0.0291
		Legal consciousness(B_{12})	0.0189
		Cooperative consciousness(B_{13})	0.0281
	Innovative spirit(B_2)	Novelty desire(B_{21})	0.0230
		Compatible consciousness(B_{22})	0.0255
	Entrepreneurial spirit(B_3)	Striving (B_{31})	0.0359
		Competition mindset(B_{32})	0.0309
Service environment (C)	Governmental service(C_1)	Administrative supervision(C_{11})	0.0109
		Entrepreneurial service quality(C_{12})	0.0376
		Entrepreneurship support policy(C_{14})	0.0402
	Financial service(C_2)	Number of financial institutions(C_{21})	0.0388
		Special fund investment(C_{22})	0.0491
		Loan approval(C_{23})	0.0569
Natural and infrastructure environment (D)	Natural environment(D_1)	Geographical and traffic location(D_{11})	0.0463
		Economic and political environment(D_{12})	0.0321
		Energy environment(D_{13})	0.0331
	Infrastructure environment(D_2)	Educational and cultural infrastructure(D_{21})	0.0405

First-level indicators	Second-level indicators	Third-level indicators	Third-level indicators' relative significance
		Communication infrastructure(D$_{22}$)	0.0385
		Venture Park Infrastructure(D$_{23}$)	0.0319
	Education degree(E$_1$)	Number of colleges and universities(E$_{11}$)	0.0416
Technological innovation surroundings (E)		Proportion of highly educated talents(E$_{12}$)	0.0413
	Innovation environment(E$_2$)	Technology Transformation Capability Index(E$_{21}$)	0.0279
		Amount of urban patents and inventions(E$_{22}$)	0.0205

4.1. Introduction to Fuzzy Consistent Preference Relationship Model

Consistent fuzzy preference relations is an evaluation method proposed by Herrera-Viedma and other researchers to determine the weight of attributes or schemes based on the hierarchy analysis. This method is based on the establishment of a complementary preference judgment matrix that are complementary and transitive. This method can accurately express the preferences and comparison opinions from the participating evaluation personnel on different attribute or scheme sets during the evaluation process, and solve the inconsistencies in the decision-making process of the participating evaluation personnel [9, 10, 11]. However, the result of fuzzy consistent preference relationship is entirely derived from the evaluation scores of the evaluators, which is greatly influenced by their subjective factors. Therefore, in the actual evaluation process, the evaluators should be given sufficient investigation and research time to make the evaluation results closer to the true situation, thus the impact of subjective factors can be reduced. The algorithm of the method is presented below.

The fuzzy consistent preference relationship includes 3 propositions:

Proposition 1 Solution Set is defined as:
$$X=\{x_1, x_2, ..., x_n\} \quad (1)$$

The complementary multiplicative preference relationship associated with is
$$A=(a_{ij}) \quad (2)$$

Where $a_{ij} \in [1/9,9]$;

The corresponding complementary fuzzy preference relationship is
$$P=(P_{ij}) \quad (3)$$

Where $p_{ij} \in [0,1]$, its relationship with A is $P = g(A)$ as expressed below:
$$P_{ij} = g(a_{ij})=(1/2)*(1+log_9(a_{ij}) \quad (4)$$

Where, g is the conversion function, which specified according to the actual situation.

$log_9(a_{ij})$ is correlates with $a_{ij} \in [1/9,9]$, which is similar as in case that if $a_{ij} \in [1/5,5]$ is used, the conversion function g should be written as the format of $log_5(a_{ij})$.

Proposition 2 For fuzzy preference relations $P=(P_{ij})$, it is specified as:
$$p_{ij} + p_{jk} + p_{ki} = \frac{3}{2}, \ \forall i < j < k \quad (5)$$

Proposition 3 For fuzzy preference relations $P=(P_{ij})$, equation (5) is further specified as:
$$p_{i(i+1)} + p_{(i+1)(i+2)} +...+ p_{(j-1)j} + p_{ji} = \frac{j-i+1}{2}, \ \forall i < j \quad (6)$$

After calculation of from Proposition 3, a>0 if P_{ij} fall outside of the interval [0, 1] and within the range of [-a, 1+a]. By this way, the conversion function can be converted into the range of [0, 1] while maintain the complementarity and additive consistency within that range. The algorithm is demonstrated as bellows:

Step 1 Calculate the set of preference values:
$$B = \left\{p_{ij}, i < j \wedge p_{ij} \notin \left\{p_{12}, p_{23},..., p_{(n-1)n}\right\}\right\} \quad (7)$$
$$p_{ji} = \frac{j-i+1}{2} - p_{i(i+1)} - p_{(i+1)(i+2)} -...- p_{(j-1)j} \quad (8)$$

Step 2 calculate the value of k:
$$k = \left|\min\left\{B \cup \left\{p_{12}, p_{23},..., p_{(n-1)n}\right\}\right\}\right. \quad (9)$$

Step 3
$$P = \left\{p_{12}, p_{23},..., p_{(n-1)n}\right\} \cup B \cup \left\{1- p_{12}, 1- p_{23}, 1- p_{(n-1)n}\right\} \cup \neg B \quad (10)$$

Step 4 The conversion function of fuzzy preference relation $P'=f(P)$ as:

$$f:[-k,1+k]\to[0,1], f(x)=\frac{x+k}{1+2k}, k>0 \quad (11)$$

4.2. Evaluation Procedure for the Nationwide Entrepreneurial Environment

(1) Experts working in the field of entrepreneurship, government and entrepreneurs were invited to evaluate and score the questionnaire. A total of 20 people were invited including 6 experts in the field of entrepreneurship, 7 government personnel, and 7 entrepreneurs. The evaluation method used the 1-9 scale as defined in Table 3. For each risk indicator C_i (i=1,2,...,n) of the nationwide entrepreneurial environment evaluation system, 20 participants E_k (k=1,2,...,m) perform two n-1 times on the C_i indicators respectively Compare and construct the judgment matrix of the importance of the nationwide entrepreneurial environment evaluation index.

$$A^k = \begin{matrix} & C_1 & C_2 & C_3 & & C_n \\ C_1 \\ C_2 \\ C_3 \\ \vdots \\ C_n \end{matrix} \begin{bmatrix} 1 & a_{12}^k & \times & \cdots & \times \\ \times & 1 & a_{23}^k & \cdots & \times \\ \times & \times & 1 & \times & \times \\ \vdots & \vdots & \vdots & \vdots & \ddots & a_{n-1n}^k \\ \times & \times & \times & \cdots & 1 \end{bmatrix} \quad (12)$$

Where a_{ij}^k represents the *k*-th participation importance evaluator's preference for C_i and C_j;

$a_{ij}^k = 1$ means that C_i and C_j have the same importance;

$a_{ij}^k > 1$ means that C_i is more important than C_j;

$a_{ij}^k < 1$ means that C_i is less important than C_j.

(2) Construct a fuzzy preference relationship for nationwide entrepreneurial environment evaluation
First, we use formula (4) to convert $\{a_{12}^k, a_{23}^k, \cdots, a_{n-1n}^k\}$ in the judgment matrix into the range among [0, 1], and then calculate p_{ij}^k in the judgment matrix of each person participating in the importance evaluation according to formulas (5) and (6).

$$P^k = \begin{matrix} & C_1 & C_2 & C_3 & & C_n \\ C_1 \\ C_2 \\ C_3 \\ \vdots \\ C_n \end{matrix} \begin{bmatrix} 0.5 & p_{12}^k & \times & \cdots & \times \\ 1-p_{12}^k & 0.5 & p_{23}^k & \cdots & \times \\ \times & 1-p_{23}^k & 0.5 & \times & \times \\ \vdots & \vdots & \vdots & \vdots & \ddots & p_{n-1n}^k \\ \times & \times & \times & \cdots & 0.5 \end{bmatrix} \quad (13)$$

Table 3 The Scale method of 1-9

Scale value	Meaning
1	x_i and x_j have the same importance
3	x_i has more importance than x_j
5	x_i has more importance than x_j
7	x_i has much more importance than x_j
9	x_i has absolutely more importance than x_j
2, 4, 6, 8	The median falls between above criteria

(3) Test of the standardization of the evaluation results of the nationwide entrepreneurial environment

The p_{ij}^k as calculated in the above steps could fall outside the interval [0,1]. Thus, the standardized test should be performed on p_{ij}^k. If p_{ij}^k is in the interval [0,1], the calculations is carried out following the procedure described above, otherwise p_{ij}^k is converted into the interval [0,1] according to the conversion function:

$$f:[-a,1+a]\to[0,1], f(x)=\frac{x+a}{1+2a} \quad (14)$$

We record the judgments of the participating importance appraisers and take the mean value of the fuzzy preference relations of the participating importance appraisers to calculate the importance of the nationwide entrepreneurial environment index as shown below:

$$p_{ij} = \frac{1}{m}\sum_{k=1}^{m} p_{ij}^k \quad (15)$$

(4) Calculating the nationwide entrepreneurial environment importance index
By the fuzzy preference relationship matrix $P=(P_{ij})$, we calculate the average preference degree of the nationwide entrepreneurial environment system indicators:

$$s_i = \frac{1}{n}\sum_{j=1}^{n} p_{ij} \quad (16)$$

The relative importance of each indicator of the nationwide entrepreneurial environment indicator system is calculated as follows.

$$w_i = \frac{s_i}{\sum_{i=1}^{n} s_i} \quad (17)$$

5. EMPIRICAL ANALYSIS

In this paper, Daqing is selected as the research object. Daqing city is a resource-based city that is "born due to oil". With the continuous exploitation and production of oil and gas, not only does the reservoir of resources decreases, but also does the ability to absorb employment into oil and gas industry shrinks dramatically. In order to alleviate unemployment pressure and maintain economic growth, Daqing has made a plan to "set off a nationwide entrepreneurial boom" and initiated the implementation of the "three-year plan" for entrepreneurial action. In order to prioritize the governmental investment allocation and take appropriate measures, it is necessary to use scientific evaluation methods to identify the key factors that affect the entrepreneurial environment of the whole people.

5.1. Evaluation Results of the Nationwide Entrepreneurial Environment in Daqing

In this study, we invited 20 experts and entrepreneurs in the field of nationwide entrepreneurial environment to enter the field of Daqing to observe the nationwide entrepreneurial environment of Daqing. We sent them each a questionnaire on the evaluation of the nationwide entrepreneurial environment one month later. Their response data were compiled in Table 4 which represent the relative importance of this indicator.

Table 4 The probability value of National Entrepreneurship Environment in Daqing

First-level indicators	Second-level indicators	Third-level indicators	Third-level indicators' relative significance
Economic environment (A)	Economy aggregate(A1)	GDP(A11)	0.0201
		tax revenue(A12)	0.0379
		Local fiscal revenue(A13)	0.0290
	Market capacity(A2)	Per capita disposable income(A21)	0.0326
		Deposit balance per capita(A22)	0.0219
		Per capita retail sales(A23)	0.0156
	Economic structure(A3)	tertiary industry contribution to GDP (A31)	0.0201
		Employment ratio from tertiary industry(A32)	0.0244
		Urban Industry Innovation and Entrepreneurship Index(A33)	0.0198
Cultural environment (B)	faithfulness and ethics(B1)	Integrity atmosphere(B11)	0.0291
		Legal consciousness(B12)	0.0189
		Cooperative consciousness(B13)	0.0281
	Innovative spirit(B2)	Novelty desire(B21)	0.0230
		Compatible consciousness(B22)	0.0255
	Entrepreneurial spirit(B3)	Striving (B31)	0.0359
		Competition mindset(B32)	0.0309
Service environment (C)	Governmental service(C1)	Administrative supervision(C11)	0.0109
		Entrepreneurial service quality(C12)	0.0376
		Entrepreneurship support policy(C14)	0.0402
	Financial service(C2)	Number of financial	0.0388

First-level indicators	Second-level indicators	Third-level indicators	Third-level indicators' relative significance
		institutions(C21)	
		Special fund investment(C22)	0.0491
		Loan approval(C23)	0.0569
Natural and infrastructure environment (D)	Natural environment(D1)	Geographical and traffic location(D11)	0.0463
		Economic and political environment(D12)	0.0321
		Energy environment(D13)	0.0331
	Infrastructure environment(D2)	Educational and cultural infrastructure(D21)	0.0405
		Communication infrastructure(D22)	0.0385
		Venture Park Infrastructure(D23)	0.0319
Technological innovation surroundings (E)	Education degree(E1)	Number of colleges and universities(E11)	0.0416
		Proportion of highly educated talents(E12)	0.0413
	Innovation environment(E2)	Technology Transformation Capability Index(E21)	0.0279
		Amount of urban patents and inventions(E22)	0.0205

5.2. Evaluation Results of the Nationwide Entrepreneurial Environment in Daqing

According to the evaluation results of the nationwide entrepreneurial environment in Daqing, the relative importance of the first-level indicators are service environment (0.2436), nature and infrastructure environment (0.2325), economic environment (0.2113), cultural environment (0.1813) science and technology innovation environment (0.1313) as ranked from high to low. Among the second-level indicators, the top five indicators are relative importance for financial institutions (0.1459), natural environment (0.1125), infrastructure environment (0.1099), government services (0.0876), total economic volume (0.0850). Among the tertiary-level indicators, the top ten in relative importance are loan approval (0.0569), special capital investment (0.0491), geographic and transportation location (0.0463), number of colleges and universities (0.0416), high The proportion of academic talents (0.0413), education and cultural infrastructure (0.0405), entrepreneurship support policy (0.0402), number of financial institutions (0.0388), communication infrastructure (0.0385), total tax revenue (0.0379).

Referring the optimized nationwide entrepreneurial environment results in Daqing, we could make strategies and take actions on the improvement of relatively important indicators as suggested in order to provide a better investment environment and encourage us business.

Firstly, the evaluation results of first level indicators suggest on emphasizing on optimizing the service environment and economic environment, which are in the top list. We should also focus on improving the level of entrepreneurial services provided by governments, financial institutions, and other organizations, adjust the economic structure, and increase market capacity. We should formulate targeted detailed implementation plan aided by the tertiary-level index evaluation results.

In optimizing the national entrepreneurial environment of Daqing, reference should be made to the evaluation results, and attention should be paid to the improvement of relatively important indicators. This article can provide data support for Daqing to optimize the national entrepreneurial environment. The initial stage of optimizing the national entrepreneurial environment of Daqing should start with the key minority:

First, focus on optimizing the service environment. In particular, efforts should be made to improve the government services through the formulation of entrepreneurial support policies; to improve the level of entrepreneurial services of financial institutions from the

perspective of improving the efficiency of entrepreneurship loan approval, establishing special capital investment, and appropriately increasing the number of financial institutions.

Second, strengthen the natural and infrastructure environment construction. Daqing should make full use of the geographical advantages of the Harbin-Daqing Industrial Corridor, strengthen the supporting infrastructure construction, provide convenient transportation for the improvement of the national entrepreneurial environment, and reduce transportation costs for the national entrepreneurship. The major communication companies, including United Mobile, China Unicom,and Telecom ,, formulate special programs to increase communication infrastructure construction, improve network coverage, and help the "Internet +" entrepreneurial model.

Third, strive to improve the city's economic environment. By adjusting the economic structure, increasing market capacity, continuously increasing the per capita disposable income, raising the level of citizen consumption, and providing the soil for the survival and development of entrepreneurship for all.

Fourth, create a strong technological and cultural environment. Daqing must maintain the colleges and universities which locate in Daqing well, including Northeast Petroleum University, Heilongjiang Bayi Agricultural University, Harbin Medical University Daqing Branch, Daqing Teachers College, Daqing Higher Medical College and other colleges and universities. On the one hand, teachers and students in universities can provide tremendous business opportunities for national entrepreneurship of Daqing. On the other hand, they can also provide intellectual support and improve the quality of Daqing national entrepreneurship. Besides, It is necessary to send entrepreneurs the necessary knowledge of industry and commerce, taxation and law through the establishment of entrepreneur training courses and other activities.

6. CONCLUSION

Optimizing the nationwide entrepreneurial environment is a long-standing and challenging task, and is an important work related to the urban transformation and development of Daqing. Daqing should make full utilize its unique natural resources and the petroleum culture that has accumulated over the decades, accelerate the transformation of the "non-oil" industry, encourage all people to create businesses, provide entrepreneurs with respect and support, and build a "glory-worthy" social environment. Through introducing reforming policies and economic assistance, we will further facilitate entrepreneurs and encourage more people brought entrepreneurial ideas to start new businesses. We suggest providing entrepreneurship education and training to entrepreneurs so that they are fully equipped with entrepreneurial skills and knowledge, and improve the success potential of their entrepreneurship. The key factors

influencing national entrepreneurial activities are not static. According to the different stages of national entrepreneurship, the influencing factors should be re-identified and relevant policies should be adjusted.

ACKNOWLEDGMENT

REFERENCES

[1] X Li, Optimization of Evaluation Index System of Regional Entrepreneurship Environment,Statistics & Decision, 15 (2009) 48-49．

[2] L Zhao, Y Zhu and R Li, Research on Evaluation Index System of Entrepreneurship Environment, Zhong xiao qi ye guan li yu ke ji, 10 (2008)120-121．

[3] N Bosma, Z Acs Jr, E Autio, A Coduras, J Levie. Global Entrepreneurship Monitor 2008 Executive Report. Babson University Press, 2009, 7-10.

[4] X Yao, D Long, Comparative Study on Technology Entrepreneurs' Quality between Hefei and Shenzhen, China Soft Science, 1 (2008), 96-101．

[5] S Wang, Construction of the evaluation system for the entrepreneurial environment of small and medium-sized enterprises in Dalian, Modern Business Trade Industry, 3 (2014), 11-12.

[6] Y Xu, Influencing Factors and Optimizing Countermeasures for Xuchang Entrepreneurial Environment, Innovation Science and Technology, 7 (2015), 54-55.

[7] Zhongwei Chen, Qian Chen, Research on the Relationship between Entrepreneurial Environment Optimization and Promoting SMEs to Participate in Supply-side Reform, Modern Management Science, 9 (2017), 9-11.

[8] Q Zhang，C Zhu, Research of Influence Factors for China's Municipalities Enterpreneurial Environment Based on BP-DEMATEL, Journal of Industrial Technological Economics, 10 (2018), 67-74.

[9] Herrera-Viedma E, Herrera F, Chiclana F, et al. Some issues on consistency of fuzzy preference

relations, European Journal of Operational Research. 154(1) (2004), 98-109.

[10] X Lin, J Liu, J Wei, Management Maturity Evaluation of Drilling Engineering Project, Journal of Engineering Management, 10 (2011), 548-552.

[11] Q Shao, H Sun, Research on the Prewarning of Commercial Bank's Operating Risk Based on Consistent Fuzzy Preference Relations, Journal of Liaoning Technical University (Social Science Edition), 5 (2018), 355-360.