

Data Mining and Forecast Analysis of Business Entrepreneurial Behavior in College Students' WeChat Friend Circle

Ma ziyi¹ Chen danhong² Yi peng³

College of Economics and Management, Shenyang Aerospace University, Shenyang, China 110136
E-mail: 2273788936@qq.com

College of Economics and Management, Shenyang Aerospace University, Shenyang, China 110136
E-mail: danhong1000@126.com

Shenyang education research institute, Shenyang, Liaoning, 110130
E-mail: yypp@163.com

Abstract: Data mining refers to the process of searching hidden information from large amounts of data through algorithms. Business entrepreneurship in WeChat Friends Circle has gained more and more popularity among college students because of its advantages of less investment capital, rapid and wide information dissemination, low risk, stable customer base and good marketing channels. This paper constructed the data mining and evaluation index system of Wechat business entrepreneurship behavior on an account of WeChat friend circle and determined the index weight by hap. Taking shenyang city of Liaoning province of China as an example, this paper uses data mining and fuzzy comprehensive evaluation method to carry out case study, and puts forward countermeasures and Suggestions according to the evaluation results.

Key Words: Data mining; Wechat business entrepreneurial behavior; Forecast analysis; Fuzzy comprehensive evaluation method

1 INTRODUCTION

Statistics from the Ministry of Human Resources and Social Security show that the number of graduates continues to rise at an annual rate of nearly 5 percent, and the employment of college students poses great employment pressure on the society. The innovative and entrepreneurial talent of college students can not only alleviate the pressure of national employment, but also provide impetus for national industrial upgrading and economic transformation [1]. At the same time, Wechat business startup behavior has attracted more and more college students to join with its features of low threshold, small investment, communication range and large customer base. Wechat business businesses based on Wechat's friend circle are mostly agents. They do not like merchants in the traditional sense to carry out commodity production and marketing, but release updates and publicize product features through Wechat's friend circle to make profits on sales[2].The path of entrepreneurship always fails due to lack of experience, insufficient funds, environmental conflicts and other reasons, the success rate of Wechat business entrepreneurship is very low [3].Therefore, in order to guide students to start a sustainable Wechat business, it is necessary to carry out data mining and prediction analysis on Wechat friends circle [4].

This research was supported by the college students' innovative entrepreneurial training plan of Shenyang Aerospace University under grant110418219 and Liaoning education department project under grant L201719. Danhong Chen is the corresponding author and instructor of this paper.

2 RESEARCH PROCESS AND METHODS

2.1 Data Mining

Data mining is the extraction, transformation, analysis and other modeling of a large number of business data in the database, from which the key data that assists business decisions is extracted. Data mining algorithm is the theoretical core of big data analysis, which is dedicated to in-depth data interior and mining the value of data [5].

2.2 Construction of Evaluation Index System

The construction of evaluation index system adopts analytic hierarchy process (hap),which is a structural inner relation judgment matrix, which can the rank the importance of various factors, and construct hierarchical analysis model, and use the analytic hierarchy model for mathematical calculation, and solve the qualitative problem by providing a simple decision-making method for the multi-objective, multi-criterion and multi-scheme solving problem [6].For example, it is assumed that the comprehensive index A of the first layer is taken as the criterion, which has A dominant relation to the evaluation index of the second layer. The construction of judgment matrix aims to assign corresponding weight to the importance of the evaluation indexes a_1, a_2, a_3 and a_4 under the comprehensive index A according to their importance. To compare two judgments, the importance of the resulting judgment matrix $A = (A_{ij})_n \times n$, where A_{ij} means factors i and j important value relative to the target.

Table 1 Judgment Matrix Scale and its Meaning

Scale	implication
1	Means UI is as important as U_j
3	Means that UI is slightly more important than U_j
5	Means that UI is significantly more important than U_j
7	Means that UI is mightily more important than U_j
9	Means that UI is more important than U_j
2, 4, 6, 8	Represents the intermediate value of the above neighboring judgment
Inverse	If the ratio of the importance of element UI to U_j is A_{ij} , then the ratio of the importance of element j to element I is $A_{ji}=1/A_{ij}$

In this paper, the common 1-9 scale method is used to judge the evaluation indexes in pairs (See table 1) for the specific meaning.

Table 2 Wechat Business Behavior Evaluation Index System

Criterion layer	Indicator level	Indicators show
Product factor	Product quality	Product performance, durability, safety and economy
	Product category	Cosmetics, clothing, shoes and bags, jewelry, food and beverage, electronic products, medicine and health care and other types complete
	Product price	Whether the price is reasonable, whether the invoice is provided, whether the channel is formal
Logistics support	Logistics speed	Timely update of logistics information, accuracy, integrity and timely delivery of goods
	Good condition	Whether there is damage to the goods, whether there are protective measures for the articles, and whether there are signs for fragile and fragile articles
Branding	Customer Service attitude	Whether the customer service message is replied in a timely manner, whether the customer problem is actually handled and the use of cordial and appropriate language
	After-sales service	Whether the after-sales application process is in place in time, whether there are special records file
	Advertising acceptance	Whether the content of advertisement production is positive, whether the release time is reasonable and whether the customer has a favorable impression on the product

Advertising trust	Whether the product promotion is reliable and credible, whether it is obtained through regular channels
-------------------	---

2.1 Determining Index Weight

The weights reflect the relative importance of each evaluation index in the index system, and the weights can be determined by the analytic hierarchy process [7]. The specific steps are as follows:

- Two evaluation indexes of Wechat business behavior based on Wechat friend circle and their weights. 12 experts with rich practical experience and theoretical basis (on the one hand, they are the typical representatives of Wechat users. On the other hand, they can make evaluation from a scientific and reasonable perspective) are selected to form a panel of evaluation experts. Each expert is asked to construct a-b and b-c judgment matrix according to the value of indicator significance (9, 7, 5, 3, 1, 1/3, 1/5, 1/7, 1/9). Take product factors (including product quality, product category and product price) as an example to calculate the weight of the second level relative to the first level. The calculation process is as follows:

Table 3 Two Evaluation Indexes and Their weights of Wechat Business Behavior

Aggregative indicator	Evaluation Index	Weight of index
A product factor (0.539)	A1 product quality	0.633
	A2 product category	0.261
	A3 product price	0.106
B Logistics Support (0.164)	B1 the speed of logistics	0.250
	B2 Good condition	0.750
C branding (0.297)	C1 customer service attitude	0.263
	C2 after-sales service	0.558
	C3 Advertising acceptance	0.057
	C4 Advertising trust	0.122

- Determine the final weight value of each indicator. Based on the weight of the same index given by 12 experts and the average value, the final weight value of each indicator of Wechat business behaviours based on Wechat friend circle was obtained.

$$A = (0.539 \ 0.164 \ 0.297)$$

$$a_1 = (0.633 \ 0.261 \ 0.106)$$

$$a_2 = (0.250 \ 0.750)$$

$$a_3 = (0.263 \ 0.558 \ 0.057 \ 0.122)$$

2.2 Fuzzy Synthetic Evaluation Model

This paper adopts the fuzzy comprehensive evaluation method to establish the Wechat business entrepreneurial service satisfaction evaluation index system for college

students, which is composed of 3 first-level indexes and 9 second-level indexes, and USES the method of hierarchical analysis to calculate the index weight. The judgment matrix of each secondary index is constructed respectively, and the reasonable weight coefficient is obtained by calculating the maximum feature root and the consistency test [8]. On this basis, the first grade of fuzzy comprehensive evaluation and the second grade of fuzzy comprehensive evaluation can be carried out. Finally, the comprehensive score value can be calculated and the grade can be assessed, so as to comprehensively evaluate the overall service satisfaction [9].

As each index in Wechat business service evaluation index system is fuzzy, it is difficult to directly determine the specific evaluation value of these indexes. Therefore, this paper adopts the fuzzy comprehensive evaluation method to evaluate Wechat business services based on Wechat friend circle from the perspective of Wechat business user satisfaction. On the basis of fuzzy mathematics, fuzzy relation synthesis is applied to quantify some factors with unclear boundaries and difficult to be quantified [10]. The specific steps are as follows:

Establish judgment set. In this paper, the evaluation set is designed as follows: $V = \{V1, V2, V3, V4, V5\}$, and the satisfaction decreases successively. Determine the fuzzy evaluation matrix. The single factor evaluation matrix was constructed by asking the interviewees to make a single factor evaluation according to the predetermined evaluation.

$$\text{leve:} \begin{bmatrix} r_{11} & \cdots & r_{1m} \\ \vdots & \ddots & \vdots \\ r_{in1} & \cdots & r_{inm} \end{bmatrix}$$

Where r_{ij} represents the frequency distribution of the factor is on the JTH comment. On this basis, according to the weight of the index determined by the analytic hierarchy process, the evaluation result of the index of the upper level is calculated by using the product of vectors, and then the evaluation result of the overall decision target is finally obtained.

2.3 Make Evaluation Conclusions

According to the principle of maximum membership degree, the evaluation result is compared with the evaluation set, and the comment corresponding to the maximum value is the final evaluation result. In this paper, the evaluation set is designed as follows: $V = \{V1, V2, V3, V4, V5\}$, and the satisfaction decreases successively.

3 CASE EMPIRICAL STUDY

Based on the analysis of the above evaluation index system, this paper takes Shenyang city of Liaoning province of China as an example to evaluate the satisfaction degree of Wechat users based on Wechat friend circle. According to the evaluation index system in table 1, 11 survey questions were designed according to the evaluation criteria of 9 secondary indexes, and the respondents were required to judge each index according to their actual conditions. The

author distributed 1,000 questionnaires at seven universities in Shenyang during weekends and other holidays. After deleting invalid questionnaires (excluding incomplete or obviously distorted ones), there were 988 valid questionnaires, and the effective recovery rate was 98.8%.

Table 4 Investigation Results

Index	Great satisfac-tion	Quite satisfact-tion	General	Dissat- isfac-tion	Very Dissat- isfac-tion
Product quality	0.071	0.409	0.427	0.082	0.011
Product category	0.139	0.590	0.190	0.070	0.011
product price	0.039	0.180	0.501	0.190	0.090
Llogistics speed	0.080	0.145	0.388	0.293	0.095
Good condition	0.100	0.340	0.360	0.180	0.020
Service attitude	0.191	0.371	0.291	0.085	0.062
Customer service	0.169	0.353	0.279	0.109	0.089
Advertising acceptance	0.082	0.095	0.355	0.298	0.170
Advertising trust	0.029	0.133	0.463	0.176	0.098

First - level comprehensive evaluation is based on second - level (lowest - level) factors. The second factor subset $u1 = \{u_{11}, u_{12}, u_{13}\}$ is illustrated as an example. Fuzzy statistical methods are used to evaluate the product factor satisfaction of 3 factors respectively.

$b11 = \{0.071, 0.409, 0.427, 0.082, 0.011\}$

$b12 = \{0.146, 0.566, 0.199, 0.068, 0.021\}$

$b13 = \{0.046, 0.181, 0.502, 0.192, 0.078\}$

As well as the single-factor evaluation matrix $R1 = (b11, b12, b13)^T$ of the factor subset $u1$, the fuzzy comprehensive evaluation set of product factor satisfaction can be obtained:

$b1 = a1$. $R1 = (0.0850, 0.4325, 0.3749, 0.0891, 0.0185)$

The fuzzy comprehensive evaluation set of logistics security and brand building satisfaction can be obtained by the same method:

$b2 = a2$. $R2 = (0.0950, 0.2900, 0.3675, 0.2075, 0.0375)$

$b3 = a3$. $R3 = (0.1475, 0.3137, 0.3092, 0.1241, 0.0879)$

On the basis of the first-level fuzzy comprehensive evaluation, the fuzzy comprehensive evaluation matrix $R = \{b1, b2, b3\}$ of the first-level factors $U = \{u1, u2, u3\}$ and the fuzzy comprehensive evaluation of Wechat business entrepreneurial satisfaction of college students in friend circle of Shenyang can be obtained:

$B = A$. $R = (0.1053, 0.3740, 0.3543, 0.1189, 0.0423)$

Next, the comprehensive score value was graded: The subjective measurement is a five - level semantic scale. The designed quantitative evaluation criteria are shown in table 5.

Table5 Evaluation of Quantitative Grading Scale

Evaluation value	Remark	Rank
$X_i > 4.5$	Great Satisfaction	E1
$3.5 < X_i \leq 4.5$	Quite Satisfactory	E2
$2.5 < X_i \leq 3.5$	General Satisfaction	E3
$1.5 < X_i \leq 2.5$	Not very satisfied	E4
$X_i \leq 1.5$	Very dissatisfied	E5

$$V1=0.0850 \times 5 + 0.4325 \times 4 + 0.3749 \times 3 + 0.0891 \times 2 + 0.0185 \times 1 = 3.4764$$

$$V2=0.0950 \times 5 + 0.2900 \times 4 + 0.3675 \times 3 + 0.2075 \times 2 + 0.0375 \times 1 = 3.1900$$

$$V3=0.1475 \times 5 + 0.3137 \times 4 + 0.3092 \times 3 + 0.1241 \times 2 + 0.0879 \times 1 = 3.2560$$

According to the above calculation, the evaluation result of Wechat business product factor, logistics guarantee and brand building evaluation index of Shenyang university's students can be obtained from the comparison table 6. The overall comprehensive evaluation score is:

$$V=0.1053 \times 5 + 0.3740 \times 4 + 0.3543 \times 3 + 0.1189 \times 2 + 0.0423 \times 1 = 3.3655$$

It shows that the overall satisfaction of Wechat business entrepreneurship of Shenyang college students in friend circle is "general", belonging to E3 level.

According to the principle of maximum membership of fuzzy comprehensive evaluation method and the data in the above calculation, it can be seen that in Wechat business service of Shenyang based on Wechat friend circle, the user evaluation results of product factors, logistics guarantee and brand building are all "general".

4 CONCLUSION AND SUGGESTIONS

Data mining is to the process of searching hidden information from large amounts of data, which is dedicated to in-depth data interior and mining the value of data [11]. The paper quantitatively evaluated the Wechat friend circle of Shenyang university students Wechat business status. This survey uses the analytic hierarchy process and the fuzzy comprehensive evaluation method to quantitatively score the Wechat business entrepreneurship status of Shenyang university students based on Wechat circle of friends, from the perspectives of product factors, logistics security and brand building. The final score is 3.3655, which is in the general level. It shows that although students in Shenyang city have achieved some achievements in Wechat business entrepreneurship based on Wechat friend circle, they still have not reached a satisfactory level. Therefore, it is urgent to put forward feasible Suggestions from the aspects of school, government, society and students themselves to solve the problems existing in the entrepreneurship of Shenyang university students based on Wechat circle of friends. The university should carry out Wechat business entrepreneurship training or set up relevant elective courses for college students within its

ability range. Government should issue relevant documents and policies on "Wechat business entrepreneurship of college students" to protect the interests of college students as much as possible. Social should develop the business ecosystem, establish the Wechat business entrepreneurial operation industry chain of university students integrating publicity, logistics and after-sales service, realize the social supervision of Wechat business behavior, and finally form a business environment conducive to the start-up of university students Wechat business. College students should provide the products with high quality and quantity, and the after-sales management mechanism should be strengthened. In addition, college students should innovate marketing model, build customer base, and carry out accurate sales and accurate promotion [12].

REFERENCES

- [1] F.Y.Qiang, Q.M.Zhu, H.H.Yan, Discussion on problems and countermeasures in the development process of Wechat business, Chinese business theory, No.7, 88-90, 2016.
- [2] R.X. Wang, Y.F.Tian, Development prospect of Wechat business and research on university students' Wechat business entrepreneurship, Shopping mall modernization, No.6, 38-39, 2016.
- [3] D.D.Niu, L.H.Yuan, Wechat business entrepreneurial model analysis of college students based on 4p-swot model, Modernization of shopping malls. No.3, 1-2, 2016.
- [4] X.H.Cheng, Z.H.Yang, Study on credit evaluation system based on improved fuzzy comprehensive evaluation method -- an empirical study with China's small and medium-sized listed companies as samples, Chinese management science, 2015 No.1, 146-152.
- [5] Q.F.Zhu, Z.P.Xu, L.Wang, Evaluation and comparative analysis of enterprise control activities based on fuzzy comprehensive evaluation method and BP neural network method, Management review, No.8, 113-123, 2013.
- [6] Y.Zhu, H.Wang, Empirical research on college students' attitudes towards Wechat social communication, Journal of chongqing university of posts and telecommunications, Social science edition, No.5, 83-88, 2014.
- [7] W.J.Ren, Z.Y.Wang, Investigation and analysis of Wechat business's operation status of college students, Time finance, No.9, 269-270, 2016.
- [8] T.Dong, Study on the advantages and disadvantages of Wechat business behavior of college students and its guidance, Journal of Changchun education college, No.6, 62-65, 2016.
- [9] D.H.Chen, T.Y.Yi, Establishment and Operation of College Students Entrepreneurship Crowdfunding Website Based on the Crowdfunding Mode, 2016 8th International Conference on Intelligent human-machine Systems and Cybernetics, 230-233, 2016.
- [10] J.Li, Research on Wechat business operation status of wangshui university students, China market, No.18, 183-185, 2016.
- [11] Y.H.Zhang, Research on Wechat business entrepreneurship of college students, Special economic zone, No.8, 139-141, 2016.
- [12] C.Wang, X.Zhen, Standardization and promotion application of Wechat business for college students, Modern business, No.12, 183-184, 2016.