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# Study on the On-line Group Purchase of Chinese Customers: A Research Based on Perceived Risk Theory

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**Abstract:** Perceived risk is the uncertainty of customers due to unpredictability of product qualities and consequences. It is the precondition of further consumption. Based on the perceived risk theory, in this article, we measure the customer's perceived risk of on-line group purchase; then establish fuzzy synthetic evaluation model of perceived risk; analyze customer behavior; and finally draw a conclusion based on data analysis.

Keywords: on-line group purchase; perceived risk; fuzzy synthetic evaluation

## 1. INTRODUCTION

On-line group purchase is a new consumption pattern in China at present. It is universally acknowledged that it originated from Groupon which was launched on November 2008 in American . The Groupon website announces the campaign (the actual price, discount rate, discounted price, the number of minimum required users and so on), then the users check the campaigns daily and buy the goods that attract them most. Just in 18 months after its launch, the approximate company value of Groupon had reached to 1.35 billion dollars. This uptrend and success made this market very attractive.

On-line group purchase has been a fashion shopping options and developed in metropolis rapidly since the first domestic imitator turned up on January 2010. China eBusiness Research Center defined it as “the bulk buying behavior to manufactures through the Internet channel to organize the same purchase intension of consumers”.

The emergence of the team buying has transformed the way of conducting business, made customer's passive position become the active position. Team buyers utilize team organization to make themselves powerful endeavoring for their best behalf. However, the problem of on-line purchase risk has grown with the acceptance of the new transaction way. Most of previous literatures researched perceived risk of online shopping based on statistical methods such as regression analysis. But customers' perception of things is often influenced by subjective factors. So the result of evaluation couldn't be reflected exactly. Besides, seldom probed into this kind of group buys, therefore, it needs study on this problem.

## 2. LITERATURE REVIEW

For now, through literatures review, the domestic investigations concerned network group buyers mainly in qualitative research. Luo Maoqun summarized the model of online group purchase and thought it mainly around two aspects. The first is to analyze the organization model, the second aspect is to discuss the operation modes<sup>[1]</sup>. Based on the perceived risk theory, by using fuzzy synthetic evaluation, this paper measure the customer's

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perceived risk of on-line group purchase.

### 2.1 Perceived risk

Perceived risk is the uncertainty of customers due to unpredictability of product qualities and consequences, the mentality feeling and subjective understanding of the objective risks during the purchase of a product. In 1960, Bauer of Harvard University firstly introduced the conception of perceived risk from psychology into consumer behavior. And he considered that perceived risk include two factors. One is the uncertainty of strategic consequences, and the other is the serious consequence of faulty decision-making. In the West, perceived risk has explained traditional shopping behavior and all kinds of media-related shopping behavior. So researchers go in for further studies in an integrant part of perceived risk. In 1972, Jacoby and Kaplan classified it into five classes: financial risk, functional risk, physical risk, psychological risk and social risk<sup>[2]</sup>. Peter(1975) put forward another important risk was time risk<sup>[3]</sup>; Stone(1993) indicates that first six risks could account for 88.8% of the risk<sup>[4]</sup>; Jarvenpaa confirmed five types of perceived risk: economic risk, social risk, functional risk, individual risk and privacy risk<sup>[5]</sup>; Featherman(2003) proves that economic risk, functional risk, psychological risk, social risk, privacy risk and time risk are six dimensions existing on internet<sup>[6]</sup>. Based on structural equation model, Jing Miao(2006) explores perceived risk scale for online shopping of Chinese consumer by using both questionnaires and interviews and put forward service risk firstly<sup>[7]</sup>, considers that privacy risk and service risk are difference from traditional dimensions of perceived risk<sup>[7]</sup>. Univariate T test and Pearson correlations indicate that perceived risk of online consumer is related to the character of the subjects of online trading. And in 2007, he explores the relationship between perceived risk and its antecedents and outcomes, proposes and validates the structural equation model of website influencing factors-perceived risk-online shopping intention<sup>[8]</sup>.

### 2.2 Fuzzy mathematics comprehensive evaluation

Fuzzy mathematics comprehensive evaluation which founded by the famous American automatic cybernetics expert professor Zadeh is a branch of fuzzy mathematics. It Bases on the principles of fuzzy mathematics, simulates the thinking mode of human brain how to deal with ambiguous information, breaks down analysis purposes to assessment result through cognitive science method, assesses single factor at different levels by using fuzzy exchange, then chooses the suitable way to get the evaluation result. Fuzzy mathematics comprehensive evaluation has not only strict quantitative description but also qualitative description. It has the advantage of analytic process and expert's investigation and the unique role in fuzzy evaluation index. At present, fuzzy mathematics comprehensive evaluation is widely applied to the field of satisfaction, marketing competitiveness, tourist perception, online shopping behavior and so on<sup>[9][10][11][12]</sup>.

This paper, based on the view of Jing Miao, establishes fuzzy synthetic evaluation model of perceived risk and then come to a conclusion.

## 3 CONSTRUCTING FUZZY COMPREHENSIVE EVALUATION OF PERCEIVED RISK

### 3.1 Set up evaluation factor set

All indices to be evaluated are collectively called a factor set, we represented it by U. Obviously U is a multi-level set.  $U = \{U_1 U_2 U_3 U_4 U_5 U_6 U_7 U_8\}$ ,  $U_i (i=1,2,3,4,5,6,7,8)$  show the first i one-level index, thereinto:  $U_1 = \{U_{11} U_{12} U_{13}\}$ ,  $U_2 = \{U_{21} U_{22} U_{23} U_{24}\}$ ,  $U_3 = \{U_{31} U_{32} U_{33}\}$ ,  $U_4 = \{U_{41} U_{42} U_{43} U_{44}\}$ ,  $U_5 = \{U_{51} U_{52} U_{53} U_{54}\}$ ,  $U_6 = \{U_{61} U_{62} U_{63}\}$ ,  $U_7 = \{U_{71} U_{72} U_{73}\}$ ,  $U_8 = \{U_{81} U_{82} U_{83}\}$ ,  $U_{ij} (i=1,2,\dots,8; j=1,2,\dots,n)$  show the first i one-level index corresponding the first j two-level index.

### 3.2 Set up the evaluation set

The evaluation set is a set consisting of different possible evaluation of the target, usually represent by V. We chose the 1-5 scale below:  $V = \{V_1, V_2, V_3, V_4, V_5\} = \{\text{Strongly disagree, Disagree, Generally agree, Agree, Strongly agree}\} = \{1,2,3,4,5\}$ . The values we have assigned to those comments so as to facilitate quantitative

calculations are shown in table 1:

**Table 1. List of values for comments**

Strongly disagree	Disagree	Generally agree	Agree	Strongly agree
1	2	3	4	5

**3.3 Set up the evaluation matrix**

The evaluation matrix indicates the membership grade of single factor U to comment set V. If there are k indices, m comment levels, then the matrix can be expressed as:

$$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \dots & \dots & \dots & \dots \\ r_{k1} & r_{k2} & \dots & r_{km} \end{bmatrix}$$

In which,  $r_{ij} = \frac{a_{ij}}{a}$  ( a is the total number of respondent,  $a_{ij}$  indicates that there are  $a_{ij}$  respondents who think  $u_i$  is subordinated to  $v_i$ -th level,  $r_{ij}$  is the corresponding membership grade of  $u_i$  in U projected in level  $v_i$  in V)

**3.4 Set up weight set**

Each item plays a different role in the perceived risk evaluation index system. Different factors  $u_i$  ( $i=1,2,\dots,k$ ) should be assigned different weight  $w_j$  ( $j=1,2,\dots,k$ ).Weights are usually determined by experts in the fuzzy synthetic evaluation. Based on the otherness of the evaluation index, in order to obtain an objective evaluation of perceived risk, in this article, we use the entropy weight method to evaluation the weights impersonally.

Usually, we use W to represent it:  $W(w_1, w_2, \dots, w_k)$ .

$$\sum w_j = 1 (j = 1, 2, \dots, k) w_j \geq 0$$

First, define  $p_{ij}$  as the weight of  $r_{ij}$  in single factor evaluation matrix:

$$p_{ij} = r_{ij} / \sum_{i=1}^m r_{ij} (j = 1, 2, \dots, k)$$

Second, suppose  $e_j$  is the entropy of j-th index,

$$e_j = -1 / \ln m \sum_{i=1}^m \ln p_{ij}$$

Finally, calculate the weights of indices:

$$w_j = (1 - e_j) / \sum_{i=1}^m (1 - e_i) (j = 1, 2, \dots, k)$$

**3.5 Conduct fuzzy synthetic evaluation**

In order to consider the influence of all the factors on the evaluation of target, a multi-level fuzzy synthetic evaluation should be conducted.

First, calculate the total evaluation set of I-th index in principle hierarchy:  $C_i$  ,

$$C_i = W_i R_i = (c_{i1}, c_{i2}, \dots, c_{iq}), i = 1, 2, \dots, k.$$

In which,  $W_i$  is the weight set of evaluation factor set  $U_i$ ,  $W_i = \{ a_{i1}, a_{i2}, \dots, a_{im} \}$  .  $R_i$  is the evaluation matrix of evaluation factor set  $U_i$ , n is the number of evaluation factor of i-th index, k is the number of indices in rule hierarchy, q is the number of evaluations in the evaluation set.

Then, calculate the synthetic evaluation set B in target hierarchy,

$$B = WC = (b_1, b_2, \dots, b_n, \dots, b_n), C = \begin{bmatrix} C_1 \\ C_2 \\ \dots \\ C_n \end{bmatrix}$$

In which, W is the weight set of evaluation set U, R is the evaluation matrix of evaluation factor set U.

And last, use fuzzy analysis to evaluate the perceived risk. Its formula is  $P = B * V^T$  ,in which, V is the

weight number matrix,  $V = (v_1, v_2, \dots, v_5)$ .

#### 4 RESEARCHS AND DATA ANALYSIS

##### 4.1 Questionnaire design and sample characteristics

We send out altogether 270 questionnaires and got back 259. The ratio of callback of valid questionnaire is 95.9%. Of these, 146, or 56.4% of the respondents, are group buyers. Among the group buyers, men are 69, accounting for 47.3 percent and women are 77, accounting for 52.7%. Looking into the age, the users from 20~30 are primary, about 90.4% of total.

##### 4.2 Perceived risk assessment of online group purchase

To take economic risk ( $Q_1$ ) for an example, using above formula, we get  $R_{11}$  first and so on. Second, we work out fuzzy relation matrix between  $Q_1$  and  $V$ . The third, all levels of assessment weight is determined by entropy method and we get  $w_1$ . Then comprehensive judgment result  $C_1$  is got. Finally, with the defuzzification, we calculate evaluation of estimate. As shown in Table 2.

Calculation process as follow:

$$R_{11} = (0.03, 0.20, 0.43, 0.27, 0.07), w_1 = (0.30, 0.29, 0.41)$$

$$R_1 = \begin{Bmatrix} 0.03 & 0.20 & 0.43 & 0.27 & 0.07 \\ 0.03 & 0.16 & 0.37 & 0.35 & 0.09 \\ 0.01 & 0.07 & 0.30 & 0.49 & 0.13 \end{Bmatrix}$$

So the comprehensive judgment result of economic risk is:  $C_1 = w_1 * R_1 = (0.02, 0.14, 0.36, 0.38, 0.10)$  ;  
 the comprehensive judgment result of functional risk is:  $C_2 = w_2 * R_2 = (0.01, 0.03, 0.30, 0.54, 0.12)$  ;  
 the comprehensive judgment result of privacy risk is:  $C_3 = w_3 * R_3 = (0.02, 0.12, 0.43, 0.32, 0.11)$  ;  
 the comprehensive judgment result of social risk is:  $C_4 = w_4 * R_4 = (0.10, 0.43, 0.33, 0.12, 0.02)$  ;  
 the comprehensive judgment result of time risk is:  $C_5 = w_5 * R_5 = (0.02, 0.14, 0.45, 0.31, 0.08)$  ;  
 the comprehensive judgment result of physical risk is:  $C_6 = w_6 * R_6 = (0.03, 0.24, 0.37, 0.28, 0.08)$  ;  
 the comprehensive judgment result of service risk is:  $C_7 = w_7 * R_7 = (0.01, 0.06, 0.25, 0.51, 0.17)$  ;  
 the comprehensive judgment result of psychological risk is:  $C_8 = w_8 * R_8 = (0.02, 0.14, 0.35, 0.39, 0.10)$  ;  
 Then the final assessment sets B:

$$B = W * C = (0.11, 0.19, 0.11, 0.12, 0.12, 0.09, 0.15, 0.11) * \begin{Bmatrix} 0.02 & 0.14 & 0.36 & 0.38 & 0.10 \\ 0.01 & 0.03 & 0.30 & 0.54 & 0.12 \\ 0.02 & 0.12 & 0.43 & 0.32 & 0.11 \\ 0.10 & 0.43 & 0.33 & 0.12 & 0.02 \\ 0.02 & 0.14 & 0.45 & 0.31 & 0.08 \\ 0.03 & 0.24 & 0.37 & 0.28 & 0.08 \\ 0.01 & 0.06 & 0.25 & 0.51 & 0.17 \\ 0.02 & 0.14 & 0.35 & 0.39 & 0.10 \end{Bmatrix}$$

$$= (0.03, 0.15, 0.35, 0.37, 0.10)$$

**Table 2. Fuzzy comprehensive assessment of online group buyers' perceived risk**

variable	Fuzzy aggregation (Cij)					P
	Strongly disagree	Disagree	Generally agree	Agree	Strongly agree	
Economic risk Q1	0.02	0.14	0.36	0.38	0.10	3.40
functional risk Q2	0.01	0.03	0.30	0.54	0.12	3.73
Privacy risk Q3	0.02	0.12	0.43	0.32	0.11	3.38
Social risk Q4	0.10	0.43	0.33	0.12	0.02	2.53
Time risk Q5	0.02	0.14	0.45	0.31	0.08	3.29
Physical risk Q6	0.03	0.24	0.37	0.28	0.08	3.14
Service risk Q7	0.01	0.06	0.25	0.51	0.17	3.77
psychological risk Q8	0.02	0.14	0.35	0.39	0.10	3.41
Comprehensive risk	0.03	0.15	0.35	0.37	0.10	3.36

## 5 CONCLUSIONS

The conclusions are got from the analysis and project example calculation in this paper as following:

According to the five assessment grade, customers think that the risk is not big and they can accept the new method of buying. But the apperceive degree is unbalanced in terms of single perceived risk.

Customers worry more about service risk which is the possibility that customers can't get customer service during online shopping. They can't enjoy pleasant and convenient services anytime and anywhere, so it becomes a prominent problem at all risks. Most of the customers consider that products lack of the after service. They think it hard to find website personnel and the seller to help resolve problems in the products.

Just behind service risk is functional risk which is the possibility that products can't be used normally or the function fall flat. Because of customers can't come into contact with products, it is impossible to ensure the product quality. The genuine product's function and appearance may look different from the company's web site. Customers cannot get what they like.

The psychological fear exists, but not intensely. Psychological risk is the possibility of mental pressure which customer suffered during online shopping. For example, there is not a written agreement on price between merchants and customers in spontaneous group purchase. If there is a problem with a product, consumer's benefits are usually hard to get valid protection. The main problem consumers reflect website and merchant unclear division of responsibility, passing the buck to each other. Therefore, in order to solve disputes, customers are undergoing a variety of psychological problems.

The perception of privacy risk and economic risk are similar. An important indicator which internet environment differs from traditional environment is privacy risk. Customers will pay more attention to whether hackers steal bank account number and password. And a pecuniary loss as the result of password stolen is the issue of most concern to consumers. Both economic risk and privacy risk refer to other problem which is caused by password stolen. So the two perceived risk is close.

The perception to the risk of time is weak. Time risk typically refers to waiting time. Because products dose not arrive at a desired time, customers have to wait for a long time; a long conversation with merchant because of defective product. This situation is brought about by two reasons: logistics hurdles and bad after-sales service. The development of Chinese logistics still remains in backward stage, and compared, logistics efficiency and service levels there are some difference. But customers worry more about problem-solving ability than spending long time in solving problems. So time risk is weak.

Customers usually do not consider physical risk. Physical risk, mainly on two factors: On the one hand the negative effects of contacting computer for a long time, such as computer radiation; on the other hand physical injury from inferior-quality products. In modern society, people are used to spending a lot of time using computers to do kinds of things, and online shopping is only a small part of it. Moreover, most group commodities are food, leisure and entertainment, and those do not cause physical damage generally. So physical risk is weaker than others.

Many customers think there is no social risk during group buying. Social risk is the possibility which thought to be an unapproved behavior. Customers don't think it is adventurous, impractical and out of vogue, and don't think it detract social status and favorable impression on their friend. In deciding whether or not to join group buying, they don't think about others' comments. People's consuming attitudes is scarcely governed by the opinions of others.

Perception risk relies on people's subjective judgment. So solving risk questions well is important for people to decide whether or not to join group buying. Fuzzy comprehensive evaluation can solve a lot of issues, such as multiple factors, fuzziness and subjective judgment. With this method, we get the result perfectly and know consumers' misgivings during group buying. Depending on the result, businesses improve their customer

service; then attract more customers.

Ultimately, this study is done among Chinese online customers and the main study limitation is lack of Chinese and foreign contrast analysis. We will continue research thoroughly to explore and the solution in the later.

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