

Discussion on Influence Factors and Evaluation of Customer Experience for B2C E-commerce Enterprises

Yilei Pei

Department of Information Management and E-commerce
Management College
Beijing Union University
Beijing, China
peiyilei@126.com

Yong Su

95997 Unit of PLA
Beijing, China
sudoo@163.com

Wanxin Xue

Department of Information Management and E-commerce
Management College
Beijing Union University
Beijing, China
xuewanxin@126.com

Dandan Li

Department of Information Management and E-commerce
Management College
Beijing Union University
Beijing, China
lidandanhdj@163.com

Abstract—With the rapid development of E-commerce, more and more E-commerce enterprises attach great importance to customer experience, and B2C E-commerce enterprises make no exception. Based on previous research literatures, the research discusses influence factors of customer experience for B2C E-commerce enterprises, establishes index system of customer experience for B2C E-commerce enterprises, apply analytic hierarchy process to determine the weight of each level index, establishes the fuzzy comprehensive evaluation model, finally conducts the case study which shows that it is more reasonable and scientific to evaluate customer experience for B2C E-commerce enterprises with analytic hierarchy process and fuzzy comprehensive evaluation.

Keywords—customer experience; B2C e-commerce enterprises; influence factors; fuzzy comprehensive evaluation

I. INTRODUCTION

According to the 35th "Statistical Report of the development of Chinese Internet" data from China Internet Network Information Center in January 2015, by the end of December 2014, the total number of Chinese Internet users has reached 649million, and Internet penetration rate has reached 47.9%; The number of Internet shopping users has reached 361 million, and has accounted for the total number of Internet users 55.7%. With the increasing number of web-based shopping consumers, online shopping market in China has upgraded continually, from the initial C2C to the integrated B2C shopping platform, to specialized and personalized excellent B2C shopping website. B2C shopping websites constantly open up new kinds of markets, and the future Chinese online shopping market will continue to increase.

The research work is supported by Beijing Higher Education Young Elite Teacher Project(No.YETP1761).

Online shopping is very popular among consumers, thus has obtained the fast development, which are because of the unique charm of the experience. When customers make the purchase decision, they attach importance to obtaining the special feeling in accordance with the personality, taste preferences and values in the process of information collection and evaluation, namely the experience. Customer experience becomes an important influence factor of consumers' online shopping behaviors, and good customer experience can promote consumers' web-based purchase behaviors.

Although customer experience is the important factor to promote purchase behaviors, but under the environment of E-Commerce customer experience has not been fully studied (Hsuan, 2011) [1], so it is very important to conduct the research on influence factors of customer experience of B2C E-commerce enterprises. Discussion on influence factors of customer experience for B2C E-commerce enterprises, and evaluation of the condition of customer experience for B2C E-commerce enterprises objectively has great theoretical value and practical guiding significance for promoting the healthy and rapid growth of B2C E-commerce enterprises and helping B2C E-commerce enterprises understand and predict consumers' online shopping intention better.

II. REVIEW OF LITERATURES

A. Online Customer Experience

Watch fire (2000) defines web experience as the consumer's whole perception about the online company [2]. Lemke et al. (2011) adopt a value-in-use approach to understand customer experience and propose it is co-created by an alignment between the customer's goals and an

organization's offering [3]. Kohler et al. (2011) & Rose et al. (2012) propose given the nature of Web 2.0 technology, in virtual environments, the customer and retailer jointly co-create experiences [4-5]. Aurélia & Thomas (2014) defines online shopping experience (OSE) and propose a conceptualization through four core dimensions: the physical, ideological, pragmatic and social dimensions [6].

According to the research above, this paper defines customer experience for B2C E-commerce enterprises as the process in which customers obtains the special feeling, form cognition and evaluation, thus affect the meeting of psychological demands and decision making through a set of shopping conditions and environments and interactive service that E-Commerce websites and operators provide.

B. Influence Factors of Customer Experience for B2C E-commerce Enterprises

Website Characteristics: Scholars study customer experience from the perspective of components of E-Commerce website characteristics. Madu (2002) proposes website characteristics include tangibility, reliability, responsiveness, assurance and empathy. If a website makes customers feel protected and cared, it can create a distinguished and unique experience, thus increase the purchase intention [7]. Jaeki (2012) thinks that website layout, the ability to select different payment means, the ability to check purchased product effectiveness, the ability to view previous orders, the ability to track orders and the ability to store and manage personal information will affect the availability of website and customer experience [8]. Mummalaneni (2005) believes that, website design and atmosphere will make online shoppers pleasant and motivated, and further affect online shoppers' satisfaction, loyalty, retention time, and the number of purchased products [9]. Guo Guoqing (2012)'s empirical research shows that the communication dimension of website interactivity is the key to enhance the value in consumption experience and satisfaction [10].

Customer Characteristics: Wang Haiping (2009) proposes customer characteristics refers to internal individual factors and behavior characteristics, including attitudes, demographic characteristics, motivation, perceived risks, individual innovation, satisfaction and trust [11]. Shi Lulu (2013) thinks that the risk of online shopping will affect customers' online shopping attitudes [12]. Liu (2008) believes that transaction costs are decisive factors affecting customer's online shopping intention, and analyzes the impact of transaction cost on customer decision from the perspective of the qualitative study [13]. Zheng Lifeng (2009) reveals that transaction costs have a negative effect on customer's online purchase intention through the empirical research [14]. Zhao Yaozhong (2013) proposes B2C E-Commerce enterprises to plan and implement user experience cost strategy from website experience cost strategy, product experience cost strategy and service experience cost strategy to obtain good customer experience [15]. Pentina et al. (2011) proposes that online customer involvement comprises interactions with the important referents through the web site, reading other customers' reviews, checking product ratings and connecting with friends via socio-digital networks [16]. Hsuan (2011)'s study shows

customer involvement in the blog affects customer experience and purchase intentions [2]. Wang Li (2007)'s study finds the higher the degree of customer involvement is, the more satisfying products the enterprise can design for customers, which can enhance customer experience [17].

Internet Word of Mouth: Shi Lulu (2013) thinks good online store image can create customer value and make customers have the psychology of reducing costs and risks and improving benefits [12]. Li Wei (2013) puts forward customers get indirect experience through customer evaluation of websites [18]. Word of mouth is more convincing than advertising and business promotion, in a variety of information sources, in addition to customers' direct using experience, the shopping and using experience from other buyers is the most valuable indirect experience which helps customers who want to purchase complete certain experience. The more detailed, more comprehensive and more real the website evaluation is, the greater the effect on customers is. Shi Lulu (2013) believes Internet word of mouth has more persuasive effect on customer attitudes and purchasing behaviors than traditional word of mouth, and establishing the evaluation system of products is an important way to improve customers' pre-sales experience [12].

III. THE INDEX SYSTEM OF CUSTOMER EXPERIENCE FOR B2C E-COMMERCE ENTERPRISES

Combining researches on influence factors of customer experience above and actuality of B2C E-commerce enterprises, the research determines first-level indexes of customer experience for B2C E-commerce enterprises consist of website characteristics, customer characteristics and Internet word of mouth three dimensions. Based on the principles of establishment of evaluation index system, consistency of index with evaluation goal, compatibility of indexes in the same system, relative independence of each evaluation index, measurability, integrity and feasibility, the paper designs evaluation index system of customer experience for B2C E-commerce enterprises. As shown in Table I .

TABLE I. EVALUATION INDEX SYSTEM OF CUSTOMER EXPERIENCE FOR B2C E-COMMERCE ENTERPRISES

One-level Indexes	Two-level Indexes
website characteristics	website usefulness
	website ease of use
	website interactivity
customer characteristics	perceived risk
	transaction costs
	customer involvement
Internet word of mouth	website popularity
	website reputation
	website influence

IV. APPLYING FUZZY-AHP TO EVALUATE CUSTOMER EXPERIENCE FOR B2C E-COMMERCE ENTERPRISES

A. Establishment of Factor Set

Based on evaluation index system, by sorting out and analyzing problems, classifying various factors, factor set is

determined. We suppose factor set $U = \{U_1, U_2, \dots, U_n\}$, which is made up of elements that affect the judgment objects.

According to evaluation index system and the analysis above, the factor set can be established.

$$U = \{U_1, U_2, U_3\}, U_1 = \{u_{11}, u_{12}, u_{13}\}, U_2 = \{u_{21}, u_{22}, u_{23}\}, U_3 = \{u_{31}, u_{32}, u_{33}\}.$$

There are 9 single factors affecting customer experience for B2C E-commerce enterprises, and they can be divided into two tiers.

B. Establishment of Weight Set

Impact factor of each index for the overall customer experience in the evaluation of customer experience for B2C E-commerce enterprises is different. In order to reflect impact effect of indexes effect objectively and scientifically, the research adopts Analytic Hierarchy Process (AHP) to determine the index weight, and transfer the qualitative problem into the quantitative calculation. Every factor has different importance degree. To reflect the differences, every factor U_i is endowed with corresponding weight w_i . And factor weight set can be established as $W = (w_1, w_2, \dots, w_n)$.

First, establish the comparison judgment matrix. Membership between the up-down hierarchy members is determined after we establish the multi-level evaluation model. Draw the pairwise comparison between elements in each hierarchy of the multi-level model for the correlative up-level element, and then establish a series of judgment matrixes as follows:

$$A - B_i = \begin{bmatrix} b_{11} & b_{12} & \dots & b_{1n} \\ b_{21} & b_{22} & \dots & b_{2n} \\ \dots & \dots & \ddots & \dots \\ b_{n1} & b_{n2} & \dots & b_{nn} \end{bmatrix}$$

In the formulation, $b_{ij} > 0$, $b_{ij} = 1/b_{ji}$, $b_{ii} = 1$. b_{ij} stands for the importance proportion scale of B_i and B_j for the correlative up-level element A. When drawing the pairwise comparison between elements, one-to-nine scale method is usually adopted as shown in Table II.

TABLE II. THE DEFINITION OF SCALE METHOD

Scale	Definition Description
1	The equal importance of two elements comparison.
3	The former is a little more important than the latter.
5	The former is obviously more important than the latter.
7	The former is mightily more important than the latter.
9	The former is extremely more important than the latter.
2,4,6,8	The intermediate values of adjacent judgments above.

The research computes the max characteristic root and characteristic vector through judgment matrix; uses characteristic root method to compute collating weight vector

and supposes that the max characteristic root of judgment matrix is λ_{\max} , and the corresponding characteristic vector is W.

Compute W and λ_{\max} , as follows:

Multiply elements of $A - B_i$ according to line;

Extract gained products for n times;

Normalize the root vector and get the collating weight vector W, as follows:

$$w_i = \sqrt[n]{\prod_{j=1}^n b_{ij}} / \sum_{i=1}^n \sqrt[n]{\prod_{j=1}^n b_{ij}} \quad (i=1, \dots, n) \quad (1)$$

$$\lambda_{\max} = \sum_{i=1}^n \frac{\sum_{j=1}^n b_{ij} w_j}{n w_i} \quad (i=1, \dots, n) \quad (2)$$

Conduct consistency check.

It is necessary for the consistency check of λ_{\max} , in order to make sure that the decision-making process is scientific. Compute CI, as follows:

$$CI = (\lambda_{\max} - n) / (n - 1) \quad (3)$$

In the formula, CI is coincidence index, and n is the order of the matrix.

Compute CR, as follows:

$$CR = CI / RI \quad (4)$$

In the formula, CR is coincidence rate, and RI is random coincidence index, whose values are in Table III.

TABLE III. RANDOM COINCIDENCE INDEXES OF JUDGMENT MATRIX

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45

When $CR < 0.1$, the research considers that judgment matrix has a good consistency, or else needs to adjust the values of elements in judgment matrix.

C. Establishment of Evaluation Set

Suppose evaluation set $V = \{V_1, V_2, \dots, V_m\}$, which is made of all kinds of total judgment results given by judges as elements.

The evaluation set V of customer experience for B2C E-commerce enterprises can be established with five evaluation

results, namely, $V = \{\text{excellent, good, moderate, common and bad}\}$.

D. Fuzzy Comprehensive Evaluation

First, customers evaluate from the single element of factor set U and experts determine the degree of membership that the evaluation objects rely on the elements of factor set. Then, the research establishes the total evaluation matrix consisting of evaluation sets of n elements. It is usually expressed as R .

After getting values of W and R , the research can do fuzzy mapping to have a comprehensive judgment. The mathematical model of fuzzy comprehensive evaluation is shown as:

$$B = W \cdot R \quad (5)$$

V. APPLICATION EXAMPLE ANALYSIS

The research conducts a fuzzy comprehensive evaluation of customer experience, based on theoretical study and combining the practical needs of certain B2C E-commerce enterprises.

According to the indexes of customer experience for B2C E-commerce enterprises, the research establishes fuzzy comprehensive evaluation step-down hierarchical model of customer experience for B2C E-commerce enterprises as shown in Figure 1.

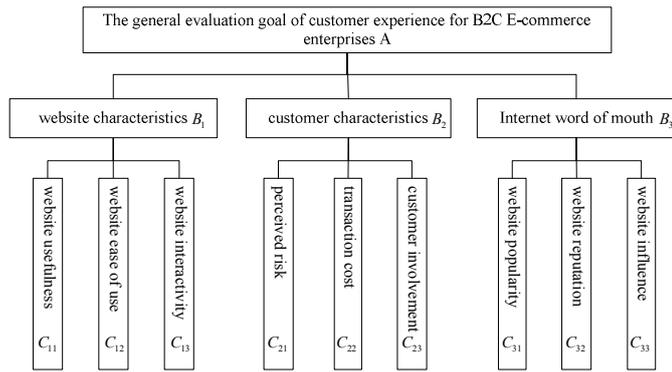


Fig. 1. Step-down hierarchical model of customer experience for B2C E-commerce enterprises

A. Abbreviations and Acronyms

Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

According to Fig .1 above, structure the judgment matrix $A-B_i$ as shown in Table IV.

TABLE IV. TABLE OF JUDGMENT MATRIX $A-B_i$

$A-B_i$	B_1	B_2	B_3
B_1	1	3	4

B_2	1/3	1	2
B_3	1/4	1/2	1

Similarly, establish the judgment matrixes of C-level elements for correlative B-level elements.

Based on Formula (1) and (2), calculate and get: $\lambda_{\max} = 3.0183$,

$W_B = (0.6250, 0.2385, 0.1365)$. W is the weight set of B-level elements for the general goal.

Based on Formula (3), calculate and get: $CI=0.0091$. When $n=3$, $RI=0.58$.

Based on Formula (4), calculate and get: $CR=0.0158 < 0.10$.

This indicates that the judgment matrix has a satisfying consistency.

Similarly, calculate all weights of evaluation indexes of customer experience of this enterprise as shown in Table V.

TABLE V. RELATIVE WEIGHTS OF CUSTOMER EXPERIENCE FOR B2C E-COMMERCE ENTERPRISES EVALUATION INDEXES

B-level indexes	Weight	C-level indexes	Weight
website characteristics	0.5396	website usefulness	0.3373
	0.1634	website ease of use	0.1021
	0.2970	website interactivity	0.1856
customer characteristics	0.2970	perceived risk	0.0708
	0.5396	transaction costs	0.1287
	0.1634	customer involvement	0.0390
Internet word of mouth	0.6250	website popularity	0.0853
	0.2385	website reputation	0.0326
	0.1365	website influence	0.0186

According to the results of Table 6, calculate and get combination weight: $W = (0.3373, 0.1021, 0.1856, 0.0708, 0.1287, 0.0390, 0.0853, 0.0326, 0.0186)$.

Evaluating factor set U is made up of nine factors influencing customer experience of this enterprise. Evaluation set V is established with five evaluation results for the factors: excellent, good, moderate, common and bad.

According to customers' test data of customer experience this enterprise, establish estimation matrix as shown in Table VI.

TABLE VI. ESTIMATION MATRIX R

	Excellent	Good	Moderate	Common	Bad
website usefulness	0.10	0.40	0.40	0.10	0
website ease of use	0.30	0.50	0.20	0	0
website interactivity	0.30	0.40	0.30	0	0
perceived risk	0.10	0.40	0.40	0.10	0
transaction costs	0.10	0.70	0.20	0	0
customer involvement	0.10	0.40	0.40	0.10	0
website popularity	0.30	0.50	0.20	0	0
website reputation	0.30	0.40	0.30	0	0
website influence	0.20	0.50	0.30	0	0

Based on $B = W \cdot R$, calculate: $B = (0.1830, 0.4592, 0.3131, 0.0447, 0)$.

According to the principle of maximum degree of membership, the maximum degree $\max(b_i) = 0.4592$, which shows that customer experience of this enterprise is the second level, namely, that is good.

VI. CONCLUSIONS

The research proposes influence factors of customer experience for B2C E-commerce enterprises, establishes evaluation index system of customer experience, and applies Fuzzy-AHP method to analyze the problem of customer experience for B2C E-commerce enterprises in depth. It is more suitable for the actual situation of B2C E-commerce enterprises to use Fuzzy-AHP method to evaluate customer experience for B2C E-commerce enterprises in China at the present stage. It has strong operability and is easy to understand that indexes of customer experience are refined and quantified. It is more reasonable and scientific to adopt Fuzzy-AHP method to transfer the qualitative problem into the quantitative study. It is conducive to conduct the comprehensive comparison and make decisions when selecting schemes. Evaluation index system of customer experience for B2C E-commerce enterprises in the paper should be further studied. There is certain subjectivity in determining the weights of indexes for different levels and it is necessary for the further research.

ACKNOWLEDGMENT

The authors thank the support from Beijing Higher Education Young Elite Teacher Project (No. YETP1761).

REFERENCE

- [1] Hsuan Yu Hsua, "Understanding customer experiences in online blog environments," *International Journal of Information Management*, 2011, vol. 31, pp. 510-523.
- [2] Watchfire Whitepaper Series, "Bad things shouldn't happen to good websites: best practices for managing the web experience," www.watchfire.com/resources/search-and-ye-shall-find.pdf, 2000.
- [3] F. Lemke, M. Clark, H. Wilson, "Customer Experience Quality: An Exploration in Business and Consumer Contexts Using Repertory Grid Technique," *J. Acad. Mark. Sci.*, 2011, vol. 39(6), pp. 846-869.
- [4] T. Kohler, J. Fueller, K. Matzler, D. Stieger, "Co-creation in Virtual Worlds: the Design of the User Experience," *MIS Q.* 2011, vol. 35(3), pp. 773-788.
- [5] S. Rose, M. Clarck, P. Samouel, N. Hair, "Online Customer Experience in E-retailing: An Empirical Model of Antecedents and Outcomes," *J. Retail.*, 2012, vol. 88(2), pp. 308-322.
- [6] Aurélie Michaud Trevinal, Thomas Stenger, "Toward A Conceptualization of the Online Shopping Experience," *Journal of Retailing and Consumer Services*, 2014, vol. (21), pp. 314-326.
- [7] Madu, Nchristian, Assumptamad, "Dimensions of E-quality," *International Journal of Quality and Reliability Management*, 2002, vol. (19), pp. 246-258.
- [8] Jaeki Songa, "Examining Online Consumers' Behavior: A Service-oriented View," *International Journal of Information Management*, 2012, vol. (32), pp. 221-231.
- [9] Mummalaneni, "An Empirical Investigation of Web Site Characteristics, Consumer Emotional States and On-line Shopping Behaviors," *Journal of Business Research*, 2005, vol. (58), pp. 526-532.
- [10] Guo Guo-qing, Li Guang-ming, "The Influence of Interactivity of Online Shopping on Consumers' Experiential Value and Satisfaction," *China Business and Market*, 2012, vol. (2), pp. 112-118.
- [11] Wang Haiping, "Review of the Research on Influencing Factors of Online Consumer Behavior," *Consumer Economics*, 2009, vol. 25(5), pp. 92-95.
- [12] Shi Lulu, Kang Hongyan, "Analysis of key elements of online shopping experience," *Manager's Journal*, 2013, vol. (3), pp. 277.
- [13] Liu Xi, "An Empirical Review on Transaction Cost Approach in Make-or-buy Decision," *Advances in Business Intelligence and Financial Engineering*, 2008, vol. (5), pp. 943-950.
- [14] Zheng Lifeng, "Impact Analysis of Transaction Cost on Purchasing Intention in Electronic Commerce Environment," *Wuxi: Jiangnan University*. 2009, pp. 15-38
- [15] Zhao Yaozhong, "Analysis of Customer Experience Cost Strategy Based on B2C E-commerce Enterprises," *Modern Economic Information*, 2013, pp. 54-55.
- [16] I. Pentina, A. Amialchuk, D. G. Taylor, "Exploring Effects of Online Shopping Experiences on Browser Satisfaction and E-tail Performance," *Int. J. Retail and Distrib. Manag.* 2011, vol. 39(10), pp. 742-758.
- [17] Wang Li, Fang Lan, Wang Fang-hua, Gu Feng, "Empirical Study on the Relationship between Internet Based Customer Involvement and New Product Development Performance Based on Software Enterprises in China," *Journal of Industrial Engineering and Engineering Management*, 2007, vol. (4), pp. 95-101.
- [18] Li Wei, "Research on Different Types of China's Consumer E-commerce Experience," *Modern Business*, 2013, vol. (28), pp. 71.