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Consumer's Demand and the Online Promotion of the e-service Quality through the Websites-An Empirical Study in China

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Abstract

Over the past several years electronic commerce (e-commerce) has changed the business transaction way, and online service quality has a significant influence on many important aspects of e-commerce. However, there are few quantitative studies on the investigation of the online service quality evaluation focused on the market in China, which is one of the developing countries with the highest online population growth. This paper is an attempt to identify the main factors affecting the online service satisfaction of the e-commerce websites in China, and Fuzzy TOPSIS is employed to evaluate the e-service quality through internet for the online consumers. The results could be the guideline for the e-commerce companies in terms of improving their online services.

Keywords: *online service, Fuzzy TOPSIS, empirical study, China*

1. Introduction

In today's intensive competitive environments the design and delivery of innovative, flexible and effective service is of paramount importance for business success [1, 2]. As the development of the internet, there are increasingly online shoppers in the world involving in the related e-commerce activities. As the one of the developing countries, China has the highest online population growth rates of online shopping. The online service quality and satisfaction are becoming increasingly important as the e-commerce companies deliver an expanding array of services through the internet. Online service quality has a significant influence on many aspects of the e-commerce, which include the consumer trust on the e-commerce companies [3-5]; attitude toward e-shopping [6]; site loyalty intentions [7,8]; willingness to pay more [9,10] and user online satisfaction [10,7].

Online e-service has been recognized as one of the most important determinants of long-term performance and success for e-commerce retailers [11-14]. It is necessary for the e-commerce companies to identify customers' needs, wants, and improve the e-service quality [15].

The remainder of this study is organized as follows. Section 2 introduces the related literature about the online service quality. Following is a brief introduction about the Fuzzy TOPSIS which is employed in this research. Section 4 discusses the main factors that have an impact on e-service through the internet and identifies the current issues in terms of improving the online service quality of the top 15 B2C e-commerce websites in retailing market in China. Section 5 is an empirical analysis of evaluating the websites of these e-commerce retailers. In the last section, the related managerial implications and major challenges for these e-commerce retailers in promoting their e-service are identified in the last part of this research.

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2. Literature Review

Recent developments in terms of e-service have led researchers and practitioners to reevaluate certain traditional concepts, such as service quality and satisfaction, in the context of information technology. Online consumers actively participate in service delivery, supplying their own effort and time, and consumers also contribute by assuming part of the responsibility for service delivery. This aspect of online purchasing can affect perceptions of service quality and satisfaction [16]. Whereas traditional service quality is defined as a “consumer's judgment about anentity's overall excellence or superiority” [17], e-service quality represents “the extent to which a website facilitates efficient and effective shopping, purchasing and delivery” [17]. The relevant literature on e-service quality indicates that a website is not simply a utilitarian tool for finding information, making choices, and ordering a product or service [18].

A series of researches have been done in terms of the web site quality measurement [19, 8], online service quality evaluation [20-22,17,16], or e-retailing quality appraisal [13] are done. In general, these results derive from rigorous development efforts and focus on important characteristics pertaining to information or the system; few consider the service dimension of online services comprehensively [23-25]. The related research results are summarized in Table 1:

Table 1. Online Service Quality Scales in Prior Related Research

Article	System related	Service related
Zeithaml *et al*. [16]	Access, ease of navigation, flexibility, reliability, price knowledge, aesthetics, efficiency, personalization, privacy.	Responsiveness, assurance
Francis and White[26]	Product attribute, functionality, ownership conditions, security	Delivery, customer service
Loiacono *et al*. [19]	Appeal, response time, flow, image, operations, better than alternatives, innovativeness, interactivity, trust	
Barnes & Vidgen[27]	Usability, design	Empathy, trust
Wolfinbarger & Gilly[13]	Website design, privacy	Fulfillment/reliability, customer service
Parasuraman *et al.*[17]	Efficiency, availability, privacy	Fulfillment
Parasuraman *et al.[*17]		Compensation, responsiveness contract
Bauer *et al*. [21]	Reliability, process, functionality/design	Responsiveness, enjoyment
Yoo & Donthu [8]	Ease of use, aesthetic design, reliability, tangibles	Responsiveness
Aldwani & Palvia[28]	Technical adequacy, specific content, content quality, web appearance	
Janda *et al*. [29]	Access, security, information	Sensation
Ranganathan & Ganapathy [30]	Information content, design, security, privacy	
Yang & Jun [31]	Reliability, access, ease of use, personalization, security	Responsiveness
Cai & Jun [32]	Website design/content	Trustworthiness, prompt/reliable service, communication
Gounaris & Dimitriadis [1]		Customer care and risk reduction benefit,

		information benefit, interaction facilitation
Jun *et al.* [33]	Ease of use, attentiveness, access, security, credibility	Reliable/prompt responses
Kim & Stoel [34]	Web appearance, entertainment, information fit-to-task, transaction capacity	Response time, trust
Lee & Lin [9]	Website design, reliability, personalization	Responsiveness, trust
Parasuraman *et al.* [17]	Efficiency, system availability, privacy	Fulfillment
Yang *et al*. [35]	Usability, usefulness of content, adequacy of information, accessibility	Interaction
Collier and Bienstock [36]	Functionality, information accuracy, design, privacy, ease of use, order condition, order accuracy , procedural fairness, outcome fairness	Timeliness, interactive fairness
Ibrahim *et al.* [37]	Convenience/accuracy, accessibility/reliability, good queue management, personalization	Friendly/responsive customer service, targeted customer service
Cristobal *et al*. [10]	Web design, assurance, order management	Customer service
Ho & Lee [7]	Information quality, security, website functionality	Customer relationships, responsiveness
Sohn & Tadisina[38]	Trust, ease of use, website content and functionality, reliability	Customized communication, speed of delivery
Wang *et al.* [39]	Reliability, competence, ease of use, product portfolio, security	Responsiveness, satisfaction
Ding *et al.* [40]	Perceived control	Service convenience, customer service, fulfillment
Hamed *et al.* [25]	Intangibility, process nature, heterogeneity, inseparability which is the simultaneousness of consumption, production and marketing, perishability, ownership, interactive nature	Self-service, non-rival

3. Methodology

3.1. Fuzzy Sets and Fuzzy Numbers

Definition 1: A Fuzzy set $\tilde{a}$ in a universe of discourse X is characterized by a membership function $\mu_{\tilde{a}}(x)$ which associates with each element x in X , a real number in the interval [0, 1]. The function of $\mu_{\tilde{a}}(x)$ is termed the grade of membership of x in $\tilde{a}$. The present study uses triangular Fuzzy numbers. $\tilde{a}$ can be defined by a triplet (a_1, a_2, a_3) . Its conceptual schema and mathematical form are shown as below:

$$\mu_{\tilde{a}}(x)\begin{cases} 0 & x \le a \\ \dfrac{x-a_1}{a_2-a_1} & a_1 \prec x \le a_2 \\ \dfrac{a_3-x}{a_3-a_2} & a_2 \prec x \le a_3 \\ 1 & x \succ a_3 \end{cases}$$

Definition 2: Let $\tilde{a} = (a_1, a_2, a_3)$ and $\tilde{b} = (b_1, b_2, b_3)$ be two triangular fuzzy numbers. According to Wang (2009), a distance measure function ($\tilde{a}$, $\tilde{b}$) can be defined as below:

$$d(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{3}[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]}$$

Definition 3: Let a triangular Fuzzy number $\tilde{a}$, then α -cut defined as below:

$$\tilde{a}_\alpha = [(a_2 - a_1)\alpha + a_1, a_3 - (a_3 - a_2)\alpha]$$

Definition 4: Let $\tilde{a} = (a_1, a_2, a_3)$, $\tilde{b} = (b_1, b_2, b_3)$ be two triangular Fuzzy number and $\tilde{a}_\alpha$, $\tilde{b}_\alpha$ be α -cut, $\tilde{a}$ and $\tilde{b}$, then the method is defined to calculate the divided between $\tilde{a}$ and $\tilde{b}$ as follows:

$$\frac{\tilde{a}_\alpha}{\tilde{b}_\alpha} = [\frac{(a_2 - a_1)\alpha + a_1}{-(b_3 - b_2)\alpha + b_3}, \frac{-(a_3 - a_2)\alpha + a_3}{(b_2 - b_1)\alpha + b_1}]$$

When $\alpha = 0$,

$$\frac{\tilde{a}_0}{\tilde{b}_0} = [\frac{a_1}{b_3}, \frac{a_3}{b_1}]$$

When $\alpha = 1$

$$\frac{\tilde{a}_1}{\tilde{b}_1} = [\frac{(a_2 - a_1) + a_1}{-(b_3 - b_2) + b_3}, \frac{-(a_3 - a_2) + a_3}{(b_2 - b_1) + b_1}]$$

$$\frac{\tilde{a}_1}{\tilde{b}_1} = [\frac{a_2}{b_2}, \frac{a_2}{b_2}]$$

So the approximated value of $\tilde{a} / \tilde{b}$ will be

$$\frac{\tilde{a}}{\tilde{b}} = [\frac{a_1}{b_3}, \frac{a_2}{b_2}, \frac{a_3}{b_1}]$$

Definition 5: Assuming that both $\tilde{a} = (a_1, a_2, a_3)$ and $\tilde{b} = (b_1, b_2, b_3)$ are real numbers, the distance measurement $d(\tilde{a}, \tilde{b})$ is identical to the Euclidean distance.

The basic operations on Fuzzy triangular numbers are as follows:

For approximation of multiplication: $\tilde{a} \otimes \tilde{b} = (a_1 \times b_1, a_2 \times b_2, a_3 \times b_3)$

For addition: $\tilde{a} \oplus \tilde{b} = (a_1 + b_1, a_2 + b_2, a_3 + b_3)$

3.2. Fuzzy Membership Function

In the evaluating process, the weights expressed with the linguistic terms, represent the important degrees of criteria from experts via surveys on subjective assessments. These linguistic terms are categorized into very low (VL), low (L), medium (M), high (H) and very high (VH). Assume that all linguistic terms can be transferred into triangular fuzzy numbers, and these fuzzy numbers are limited in [0, 1]. As a rule of thumb, each rank is assigned an evenly spread membership function that has an interval of 0.30 or 0.25.

Based on assumptions above, a transformation table can be found as shown in Table 2. Figure 1 illustrates the Fuzzy membership function.

Table 2. Transformation for Fuzzy Membership Functions

Rank	Sub-criteria grade	Membership function
Very Low (VL)	1	(0.00,0.10,0.25)
Low (L)	2	(0.15,0.30,0.45)
Medium (M)	3	(0.35,0.50,0.65)
High (H)	4	(0.55,0.70,0.85)
Very High (VH)	5	(0.75,0.90,1.00)

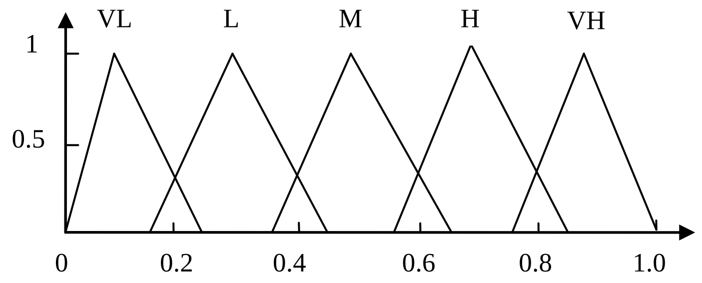

Figure 1. Fuzzy Triangular Membership Functions

3.3. Fuzzy TOPSIS Model

It is formulated that a Fuzzy Multiple Criteria Decision Making (FMCDM) problem about the comparative evaluation of the selected websites. The FMCDM problem can be concisely expressed in matrix format as follows:

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ \vdots \\ A_n \end{array} \begin{array}{c} \begin{array}{ccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \tilde{x}_{13} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \tilde{x}_{23} & \cdots & \tilde{x}_{2n} \\ \tilde{x}_{31} & \tilde{x}_{32} & \tilde{x}_{33} & \cdots & \tilde{x}_{3n} \\ \vdots & & & & \\ \tilde{x}_{n1} & \tilde{x}_{n1} & \tilde{x}_{n1} & \cdots & \tilde{x}_{n1} \end{bmatrix} \end{array}$$

$$\tilde{W} = [\tilde{w}_1, \tilde{w}_2, \cdots \tilde{w}_n]$$

Where $x_{ij}, i = 1, 2, \cdots, m;\ j = 1, 2, \cdots, n$ and $\tilde{w}_j, j = 1, 2, \cdots, n$ are linguistic triangular Fuzzy numbers, $\tilde{x}_{ij} = (a_{ij}, b_{ij}, c_{ij})$ and $\tilde{w}_j = (a_{j1}, b_{j2}, c_{j3})$. The normalized Fuzzy decision matrix is denoted by $\tilde{R} = [\tilde{r}_{ij}]_{m \times n}$.

The weighted Fuzzy normalized decision matrix is shown as follows:

$$V = \begin{bmatrix} \tilde{v}_{11} & \tilde{v}_{12} & \tilde{v}_{13} & \cdots & \tilde{v}_{1n} \\ \tilde{v}_{21} & \tilde{v}_{22} & \tilde{v}_{23} & \cdots & \tilde{v}_{2n} \\ \tilde{v}_{31} & \tilde{v}_{32} & \tilde{v}_{33} & \cdots & \tilde{v}_{3n} \\ \vdots & & & & \\ \tilde{v}_{n1} & \tilde{v}_{n1} & \tilde{v}_{n1} & \cdots & \tilde{v}_{n1} \end{bmatrix}$$

$$= \begin{bmatrix} \tilde{w}_1\tilde{r}_{11} & \tilde{w}_2\tilde{r}_{12} & \tilde{w}_3\tilde{r}_{13} & \cdots & \tilde{w}_n\tilde{r}_{1n} \\ \tilde{w}_1\tilde{r}_{21} & \tilde{w}_2\tilde{r}_{22} & \tilde{w}_3\tilde{r}_{23} & \cdots & \tilde{w}_n\tilde{r}_{2n} \\ \tilde{w}_1\tilde{r}_{31} & \tilde{w}_2\tilde{r}_{32} & \tilde{w}_3\tilde{r}_{33} & \cdots & \tilde{w}_n\tilde{r}_{3n} \\ \vdots & & & & \\ \tilde{w}_1\tilde{r}_{m1} & \tilde{w}_2\tilde{r}_{m2} & \tilde{w}_3\tilde{r}_{m3} & \cdots & \tilde{w}_n\tilde{r}_{mn} \end{bmatrix}$$

Given the above Fuzzy theory, the proposed Fuzzy TOPSIS procedure is then defined as follows:

Step 1: choose the $x_{ij}, i = 1, 2, \cdots, m; j = 1, 2, \cdots, n$ for alternatives with respect to criteria and $\tilde{w}_j, j = 1, 2, \cdots, n$ for the weight of the criteria.

Step 2: Construct the weighted normalized Fuzzy decision matrix V .

Step 3: Identify positive ideal (A^+) and negative ideal (A^-) solutions:

$$A^+ = \{\tilde{v}_1^+, \tilde{v}_2^+, \cdots \tilde{v}_n^+\}$$
$$= \{(\max_i \tilde{v}_{ij} \mid i = 1, 2, \cdots, m), j = 1, 2, \cdots, n\}.$$
$$A^- = \{\tilde{v}_1^-, \tilde{v}_2^-, \cdots \tilde{v}_n^-\}$$
$$= \{(\min_i \tilde{v}_{ij} \mid i = 1, 2, \cdots, m), j = 1, 2, \cdots, n\}.$$

Step4: Calculate separation measures. The distance of each alternative from A^+ and A^- can be identified as follows:

$$d_i^+ = \frac{1}{n}\sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^+), i = 1, 2, \cdots, m$$
$$d_i^- = \frac{1}{n}\sum_{j=1}^{n} d(\tilde{v}_{ij}, \tilde{v}_j^-), i = 1, 2, \cdots, m$$

Step 5: Calculate the similarities to ideal solution:

$$CC_i = \frac{d_i^-}{d_i^+ + d_i^-}$$

Step 6: Rank alternatives according to CC_i in descending order (Yang and Hung, 2007).

4. Data Collection and Results Analysis

Considering the differences among B2C, C2C and B2B e-commerce, and our research is focus on B2C e-commerce websites in China, the top 15 B2C e-commerce websites in retail market as shown in table 3 are selected based on the user coverage.

Table 3. The Top 15 B2C e-commerce Websites in Retail Market in China

No.	E-Commerce Website	No. of users (per million)
E_1	Tmall	9010
E_2	Jingdong Mall	6940
E_3	Tencent	3930
E_4	Amazon	3450
E_5	Handle group buying	2580
E_6	Dangdang	2160
E_7	Vancl	2160
E_8	Full King	1290
E_9	No.1	1050
E_{10}	F group buying	770
E_{11}	Yixun	760
E_{12}	Moonbasa	700
E_{13}	Letao	640
E_{14}	Newegg	600
E_{15}	M18	570

The specific original measures are listed in Table 4. The decision problem contains three levels: the highest level is the objective of the problem, while the criteria are listed in the second level, and the sub-criteria are listed in the third level.

Table 4. The Measures of Online Service Quality

Goal	Aspects	Criteria
Assessment of online service quality	A_1 *System related*	C_1 Efficiency C_2 Ease of navigation C_3 Flexibility C_4 Reliability C_5 Price knowledge C_6 Aesthetics C_7 Personalization C_8 Ownership conditions C_9 Ease of use C_{10} Speed
	A_2 *Service related*	C_{11} Responsiveness C_{12} Assurance C_{13} Delivery C_{14} Customer service

The important degrees of the above sub-criteria weights are given with linguistic terms, as shown in Table 2, employed by four decision makers, as shown in Table 5.

Table 5. The Fuzzy Weights Given by Four Decision Makers

Criteria	DM_1	DM_2	DM_3	DM_4
C_1	H	M	H	VH
C_2	VH	H	H	VH
C_3	L	M	M	M
C_4	H	M	H	H
C_5	H	M	H	H
C_6	M	L	M	L
C_7	L	L	L	VL
C_8	M	H	M	L
C_9	M	L	M	L
C_{10}	M	H	L	H
C_{11}	L	M	L	M
C_{12}	H	VH	VH	H
C_{13}	H	M	H	M
C_{14}	H	M	H	H

The original decision matrix is identified by the raters by observing the websites, and the normalized decision matrix is then derived from the original data as shown in Table 6.

The larger, the better type:

$$r_{ij} = \frac{\left[x_{ij} - \min\left\{ x_{ij} \right\} \right]}{\left[\max\left\{ x_{ij} \right\} - \min\left\{ x_{ij} \right\} \right]}$$

The smaller, the better type:

$$r_{ij} = \frac{\left[\max\left\{ x_{ij} \right\} - x_{ij} \right]}{\left[\max\left\{ x_{ij} \right\} - \min\left\{ x_{ij} \right\} \right]}$$

Table 6. Part of the Normalized Decision Matrix

No.	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
E_1	0.9	0.8	0.8	0.9	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.9
E_2	0.9	0.9	0.9	0.9	0.9	1	0.6	0.8	0.7	0.7	0.8	0.9
E_3	0.9	0.9	0.9	0.8	0.8	0.9	0.8	0.8	0.8	0.7	0.9	0.8
E_4	0.8	0.8	0.6	0.7	0.8	0.7	0.8	0.7	0.8	0.8	0.7	0.7
E_5	0.7	0.7	0.9	0.8	0.6	0.8	0.6	0.5	0.7	0.4	0.8	0.4
E_6	0.8	0.9	0.6	0.6	0.8	0.9	0.8	0.8	0.8	0.7	0.7	0.8
E_7	0.8	0.6	0.5	0.8	0.8	0.8	0.7	0.7	0.6	0.7	0.5	0.8
E_8	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.6	0.7	0.7	0.8
E_9	0.8	0.8	0.6	0.8	0.8	0.9	0.6	0.8	0.8	0.5	0.7	0.8
E_{10}	0.7	0.9	0.6	0.8	0.8	0.9	0.8	0.8	0.8	0.7	0.8	0.7
E_{11}	0.6	0.8	0.8	0.9	0.8	0.7	0.6	0.5	0.7	0.8	0.6	0.6
E_{12}	0.5	0.5	0.8	0.6	0.8	0.6	0.5	0.7	0.8	0.4	0.7	0.7
E_{13}	0.6	0.8	0.6	0.7	0.7	0.8	0.6	0.8	0.7	0.6	0.6	0.5
E_{14}	0.5	0.4	0.8	0.6	0.8	0.7	0.7	0.8	0.5	0.4	0.8	0.6
E_{15}	0.8	0.7	0.6	0.8	0.8	0.7	0.8	0.7	0.6	0.6	0.6	0.8

Then the normalized decision matrix using Fuzzy linguistic variables shown in Table 7 can be identified by the Fuzzy membership function proposed in Section 3.2.

Table 7. Part of the Normalized Decision Matrix using Fuzzy Linguistic Variables

No.	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
E_1	VH	H	H	VH	VH	H	H	VH	H	H	H	VH
E_2	VH	VH	VH	VH	VH	VH	M	H	H	H	H	VH
E_3	VH	VH	VH	H	H	VH	H	H	H	H	VH	H
E_4	H	H	M	H	H	H	H	H	H	H	H	H
E_5	H	H	VH	H	M	H	M	M	H	L	H	L
E_6	H	VH	M	M	H	VH	H	H	H	H	H	H
E_7	H	M	M	H	H	H	H	H	M	H	M	H
E_8	H	H	H	H	H	H	H	H	M	H	H	H
E_9	H	H	M	H	H	VH	M	H	H	M	H	H
E_{10}	H	VH	M	H	H	VH	H	H	H	H	H	H
E_{11}	M	H	H	VH	H	H	M	M	H	H	M	M
E_{12}	M	M	H	M	H	M	M	H	H	L	H	H
E_{13}	M	H	M	H	H	H	M	H	H	M	M	M
E_{14}	M	L	H	M	H	H	H	H	M	L	H	M
E_{15}	H	H	M	H	H	H	H	H	M	M	M	H

The Fuzzy linguistic variable is then transformed into a Fuzzy triangular membership function as shown in Table 8, and then the resulting Fuzzy weighted decision matrix can be derived based on Table 8 and the weights identified before. The distance of each alternative from A^+ and A^-, as well as the similarities to an ideal solution (*CCi*), is obtained in Table 9.

Table 8. Part of the Fuzzy Decision Matrix

	C_1	C_2	C_3	C_4	C_5
E_1	(0.75,0.90,1.00)	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.75,0.90,1.00)	(0.75,0.90,1.00)
E_2	(0.75,0.90,1.00)	(0.75,0.90,1.00)	(0.75,0.90,1.00)	(0.75,0.90,1.00)	(0.75,0.90,1.00)
E_3	(0.75,0.90,1.00)	(0.75,0.90,1.00)	(0.75,0.90,1.00)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_4	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_5	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.75,0.90,1.00)	(0.55,0.70,0.85)	(0.35,0.50,0.65)
E_6	(0.55,0.70,0.85)	(0.75,0.90,1.00)	(0.35,0.50,0.65)	(0.35,0.50,0.65)	(0.55,0.70,0.85)
E_7	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_8	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_9	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_{10}	(0.55,0.70,0.85)	(0.75,0.90,1.00)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_{11}	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.75,0.90,1.00)	(0.55,0.70,0.85)
E_{12}	(0.35,0.50,0.65)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.55,0.70,0.85)
E_{13}	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
E_{14}	(0.35,0.50,0.65)	(0.15,0.30,0.45)	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.55,0.70,0.85)
E_{15}	(0.55,0.70,0.85)	(0.55,0.70,0.85)	(0.35,0.50,0.65)	(0.55,0.70,0.85)	(0.55,0.70,0.85)
$\otimes w_j$	(0.55,0.70,0.84)	(0.65,0.80,0.93)	(0.30,0.45,0.60)	(0.50,0.65,0.80)	(0.50,0.65,0.80)

Table 9. The Distance of each Alternative from A^+ and A^-

E-Commerce	d_i^+	d_i^-	CCi
Tmall	0.03412	0.204884	0.857241
Jingdong Mall	0.023991	0.214935	0.899587
Tencent	0.049565	0.189531	0.792697
Amazon	0.100974	0.13825	0.577909
Handle group buying	0.166283	0.072738	0.304316
Dangdang	0.094963	0.14412	0.602804
Vancl	0.106483	0.132646	0.554705
Full King	0.090915	0.148385	0.620079
No.1	0.107855	0.13134	0.549092
F group buying	0.085558	0.153569	0.642207
Yixun	0.124634	0.114415	0.478625
Moonbasa	0.1512	0.087884	0.367587
Letao	0.140376	0.09872	0.412889
Newegg	0.188149	0.05084	0.212731
M18	0.13909	0.100051	0.418375

5. Conclusions

This paper is an attempt to identify the main factors affecting the online service satisfaction of the e-commerce websites in China, and Fuzzy TOPSIS is employed to evaluate the e-service quality through internet for the online consumers. Considering the differences among B2C, C2C and B2B e-commerce, and this research is focus on B2C e-commerce websites in China, the top 15 B2C e-commerce websites in retail market are selected based on the user coverage.

According to the result of this research, there exist large gap among the selected top 15 B2C e-commerce websites in China in terms of the e-service quality, for example, the highest score among these e-commerce websites is 0.899587, whereas the lowest scores is 0.212731. The top three e-commerce websites (Tmall, Jingdong Mall and Tencent) have the relatively better performance than others. According to the criteria weights derived from this section earlier, the suggestions for these e-commerce websites to improve their e-service are: (1) the e-commerce companies shall improve the customer service to excellent standards; (2) the e-commerce companies shall focus on flexibility and responsiveness to be able to adapt to market changes; (3) the e-commerce companies shall focus on efficiency to make sure the online shoppers can search the goods they wanted in short time; (4) the e-commerce companies shall improve the assurance to absorb more online shoppers and (5) the e-commerce companies should promote ease of use through better user interface design on the websites.

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