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Main Factors Affecting the Performance of the B2C e-commerce Companies in Retail Market in China

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Abstract

As the development of the internet, there are increasingly online shoppers in the world engaging in e-commerce activities. As the biggest developing country, China has the highest online population growth rates in terms of online shopping. For companies to take full advantage of the potential offered by the Web, it is essential that their electronic commerce (e-commerce) websites be prepared and organized in highly usable manner. This paper is an attempt to investigate the main factors affecting the performance of the top 10 B2C e-commerce companied in retail market in China. GRA (Grey Relational Analysis) and Fisher's exact test is applied to identify the main affecting factors of online performance of the selected e-commerce companied. The results could be the guideline for the e-commerce companies in terms of improving their online popularity. The managerial implications and suggestions for future research are also discussed.

Keywords: *online performance, Fisher's exact test, empirical study, China*

1. Introduction

The advent of the Internet has led to the flourishing development of e-commerce. As one of the biggest developing countries that experience the highest online population growth, there are increasingly online shoppers engaging in e-commerce activities in China. According to the report by the China Internet Network Information Center (CNNIC, 2013), China's e-commerce market racked up a whopping 190 billion USD transactions in 2012, an increase of 66.5 percent over 2011′s, and more than two hundred million online shoppers purchased products through internet. According to forecasts (Ystats, 2013), it is expected to grow by more than 30 percent annually from 2013 to 2016.

The online performance is becoming increasingly important as the e-commerce companies deliver an expanding array of service through the internet, in which the websites clearly emerge as a critical channel for e-commerce companies. With the development of the e-commerce, online shoppers have used the e-commerce websites to obtain the related information in terms of the products and services, with possible follow-up purchase (Korner and Zimmerman, 2000; Geissler, 2001). From observations, however, there exist many issues and challenges in the current e-commerce companies regarding the actual performance in terms of the effectiveness of their promotional effort. In order to provide practical insight and

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guidelines for improving the performance of these e-commerce companies, an investigative empirical study is needed, which is the primary motivation of this research.

This paper is an attempt to identify the main factors affecting online performance for the e-commerce companies in retail market in China, which could be the guideline for the improvement of the companies. The remainder of this study is organized as follows. Section 2 introduces the related literature about the e-commerce. Following is a brief introduction about the GRA and Fisher's exact test which are employed in this research. Section 4 discusses the main factors that have impact on the online performance in China. In the last section, the related managerial implications of this research are discussed.

2. Literature Review

E-commerce is "any form of business transaction in which the parties interact electronically rather than by physical exchanges or direct physical contact" (Ecom, 1998), and is generally classified as B2B, B2C, C2C and C2B e-commerce (Madu and Madu, 2002). Jennifer *et al.* (2003) argue that B2B e-commerce seems to be driven by global forces, whereas B2C seems to be more of a local phenomenon. While along with the advancement of information technology, there are increasingly online shoppers buying products through the e-commerce websites. Many related researches have been done on improving effectiveness of the e-commerce websites (Thorleuchter and Poel, 2012; Li and Li, 2011; Nielsen, 1999; Nielsen and Tahir, 2001).However, a study by Elliot and Fowell (2000) show that the online shoppers have been relatively frustrated with the quality of the websites they visited.

A series of researches have been done about website quality (Loiacono *et al.*, 2002; Yoo and Donthu, 2001, Aladwani and Palvia, 2002; Kim and Stoel, 2004; Koufaris, 2002; Soliman and Youssef, 2003), online service quality evaluation (Bauer *et al.*, 2006; Parasuraman *et al.*, 2005; Zeithaml *et al.*, 2000), and e-retailing quality appraisal (Wolfinbarger and Gilly, 2003) are studied in the related researches. Swaminathan *et al.* (1999) argue that consumers evaluate websites when they make purchase decisions and the perception of their shopping experience at the websites plays a major role in creating demand for online purchasing. The perceived online service quality and satisfaction are two main characters which are used by consumers to evaluate e-commerce companies' quality. Service quality remains of focal interest to researchers and practitioners. Some researchers consider the delivered service that meet the customer's expectation is the key point. A research by Davidavičienė and Tolvaišas (2012) describe the quality factors of an e-commerce website and services based on the survey of Lithuanian online store visitors. The research by Zhang *et al.* (2011) shows that customer repurchase intention is impacted by online relationship quality and perceived website usability. Moreover, perceived vendor expertise in order fulfillment, perceived vendor reputation, and perceived website usability are positive for the relationship, whereas distrust in vendor behavior negatively influenced online relationship quality. Investigating the main factors affecting the online performance is important for the companies to develop the website that can attract online shoppers and communicate successfully with their customers, which eventually helps the company to sell its products and satisfy and retain its customers. However, Goi (2012) observes that although website design and development is concerned, few sets of criteria are available on the web and from the researchers' website evaluation criteria. The study by Lin (2007) shows that design, informativeness, security responsiveness, interactivity, and trust affect customer satisfaction, while empathy does not have a statistically significant effect on customer satisfaction. Cao *et al.* (2011) identify factors affecting the e-commerce website quality using an IS (Information System) success model which include system quality, information quality, service quality and attractiveness.

In summary, the performance of B2C e-commerce companies both in theory and in practice has proven to be very important and quite complex, and there are few studies focusing on the performance of the B2C e-commerce companies in China, which is the primary motivation of this research.

3. Methodology

3.1. Grey System Theory

Grey system theory which can help evaluate outcomes under the situation with incomplete and indeterminate information is first proposed in 1982 (Deng, 1982). Considering the incomplete information in this paper, grey approach which has been recognized as an effective tool to solve this kind of the problems is adopted to select the leading industries.

To introduce some fundamental aspects of grey system theory, some basic definitions and notation are shown as follows:

x is denoted as a closed and bounded set of real numbers. A grey number, $\otimes x$, is defined as an interval with known upper and lower bounds but unknown distribution information for x (Deng, 1989), which is,

$$\otimes x = [\underline{\otimes} x, \bar{\otimes} x] = [x' \in x \mid \underline{\otimes} x \leq x' \leq \bar{\otimes} x]$$

where $\underline{\otimes} x$ and $\bar{\otimes} x$ are the lower and upper bounds of $\otimes x$ respectively.

Expression (2)－(5) demonstrate some basic grey number mathematical operations:

$$\otimes x_1 + \otimes x_2 = [\underline{x_1} + \underline{x_2}, \overline{x_1} + \overline{x_2}]$$

$$\otimes x_1 - \otimes x_2 = [\underline{x_1} - \overline{x_2}, \overline{x_1} - \underline{x_2}]$$

$$\otimes x_1 \times \otimes x_2 = [\min(\underline{x_1}\,\underline{x_2}, \underline{x_1}\,\overline{x_2}, \overline{x_1}\,\underline{x_2}, \overline{x_1}\,\overline{x_2}), \max(\underline{x_1}\,\underline{x_2}, \underline{x_1}\,\overline{x_2}, \overline{x_1}\,\underline{x_2}, \overline{x_1}\,\overline{x_2})]$$

$$\otimes x_1 \div \otimes x_2 = [\underline{x_1}, \overline{x_1}] \times [\frac{1}{\underline{x_2}}, \frac{1}{\overline{x_2}}]$$

3.2. GRA (Grey Relational Analysis)

Below is a briefly review of relevant definitions and the calculation procedure for the GRA approach.

GRA uses several small sub-problems to present the decision problem, and the problem is decomposed into a hierarchy with a goal at the top, criteria and sub-criteria at levels and sub-levels and decision alternatives at the bottom of the hierarchy.

The comparison matrix involves the comparison in pairs of the elements of constructed hierarchy. The aim is to set their relative priorities with respect to each of the elements at the next higher level.

$$D = \begin{array}{c} \\ C_1 \\ C_2 \\ C_3 \\ \vdots \\ C_m \end{array} \begin{array}{c} \begin{array}{ccccc} C_1 & C_2 & C_3 & \cdots & C_n \end{array} \\ \begin{bmatrix} x_{11} & x_{12} & x_{13} & \cdots & x_{1n} \\ x_{21} & x_{22} & x_{23} & \cdots & x_{2n} \\ x_{31} & x_{32} & x_{33} & \cdots & x_{3n} \\ \vdots & & & & \\ x_{m1} & x_{m2} & x_{m3} & \cdots & x_{mn} \end{bmatrix} \end{array}$$

Where x_{ij} is the degree preference of i^{th} year over j^{th} criterion. Before the calculation of vector of priorities, the comparison matrix has to be normalized into the range of [0, 1] by the equation below:

The larger, the better type (Yang and Hung, 2007):

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

The smaller, the better type:

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

The normalized decision matrix is denoted by $Y = [y_{ij}]_{m \times n}$.

Assume Y is a factor set of grey correlation. Let $y_0(k)$ and $y_i(k)$ denote the initial criteria values of y_0 and y_i on company k respectively.

As average correlation value $r(y_0, y_i)$ of $\{r(y_0(k), y_i(k)) | k = 1, 2, ..., m\}$ is a real number, the value can be defined by grey correlation.

Let $r(y_0, y_i) = \frac{1}{m}\sum_{k=1}^{m} r(y_0(k), y_i(k)) = r_{0i}$,where

$$r(y_0(k), y_i(k)) = \frac{\min_i \min_k |y_0(k) - y_i(k)| + \rho \max_i \max_k |y_0(k) - y_i(k)|}{|y_0(k) - y_i(k)| + \rho \max_i \max_k |y_0(k) - y_i(k)|}$$

, where ρ is the distinguished coefficient ($\rho \in [0,1]$).

Grey correlation matrix $R = (r_{ij})$ is derived by grey correlation analysis, where $i = 1, 2, \ldots, m$, $j = 1, 2, \ldots, n$. The definition of clustering financial ratios based on the entries of the grey correlation matrix is presented as follows.

Definition 3.1 As $r_{ij} \geq r$ and $r_{ji} \geq r$, Y_i and Y_j belong to the same cluster, where r is a threshold value of clustering.

Definition 3.2 When $r_{ij} \geq r$, $r_{ji} \geq r$, $r_{ik} \geq r$ and $r_{ki} \geq r$, but $r_{jk} < r$ or $r_{kj} < r$, if $min\{ r_{ij}, r_{ij} \} \geq min\{ r_{ki}, r_{ik} \}$, then Y_i , Y_j and Y_k belong to the same cluster.

As those indices can be partitioned into several clusters, the finding of representative indices of clusters is stated as follows.

Definition 3.3 As Y_i and Y_j belong to the one cluster, the representative index of the cluster is determined according to the maximum value of r_{ij} and r_{ji}. If $r_{ij} \geq r_{ji}$, the representative index of the cluster is financial ratio *i*.

Definition 3.4 As $Y_{i,}$ Y_j and Y_k are in the one cluster, the representative index of the cluster is decided according to the maximum value of $r_{ij} + r_{ik}$, $r_{ji} + r_{jk}$ and $r_{ki} + r_{kj}$. If $r_{ij} + r_{jk}$ is the maximum value, then the representative index of the cluster is financial ratio i.

3.3. Fisher's Exact Test

Fisher's exact test was first proposed in 1992 (Fisher, 1922). It is a statistical significance test in the analysis of contingency tables, and is suitable for the analysis when some of the frequencies are low and use of the chi-squared test is ruled out (*i.e.*, some expected values are 0 or less than twenty percents are less than 5). Fisher's exact test is one of a class of exact tests because the significance of the deviation from a null hypothesis can be calculated exactly, rather than relying on an approximation that becomes exact in the limit as the sample size grows to infinity, as with many statistical tests.

The following is an example to illustrate the theory of the fisher's exact test: a sample of teenagers might be divided into male and female on the one hand, and those that are and are not currently dieting on the other. The hypothesis is that the proportion of dieting individuals is higher among the women than the men, and whether any difference of proportions is significant is tested, and the data is shown as follows:

Table 1. The 2*2 Contingency Table for the Sample

	Men	Women	*Row total*
Dieting	*1*	*9*	*10*
Non-dieting	*11*	*3*	*14*
Column total	*12*	*12*	*24*

These data would not be suitable for analysis by Pearson's chi-squared test, because the expected values in the table are all below 10, and in a 2 * 2 contingency table, the number of degrees of freedom is always 1.

Before we proceed with the Fisher's exact test, we first introduce some notation. We represent the cells by the letters a, b, c and d, call the totals across rows and columns marginal totals, and represent the grand total by n:

Table 2. The 2*2 Contingency Table for the Sample with the Representative Letters

	Men	Women	*Row total*
Dieting	*a*	*b*	*a+b*
Non-dieting	*c*	*d*	*c+d*
Column total	*a+c*	*b+d*	*a+b+c+d=n*

The probability of obtaining any such set of values was given by the hypergeometric distribution:

$$p = \frac{\binom{a+b}{a}\binom{c+d}{c}}{\binom{n}{a+c}} = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{a!b!c!d!n!}$$

Where $\binom{n}{k}$ is the binomial coefficient and the symbol ! indicates the factorial operator.

$$p = \frac{\binom{10}{1}\binom{14}{11}}{\binom{24}{12}} = \frac{10!14!12!12!}{1!9!11!3!24!} \approx 0.001346076$$

The formula above gives the exact hypergeometric probability of observing this particular arrangement of the data, assuming the given marginal totals, on the null hypothesis that men and women are equally likely to be dieters. To put it another way, if we assume that the probability that a man is a dieter is p, the probability that a woman is a dieter is p, and it is assumed that both men and women enter our sample independently of whether or not they are dieters, then this hypergeometric formula gives the conditional probability of observing the values a, b, c, d in the four cells, conditionally on the observed marginals. This remains true even if men enter our sample with different probabilities than women. The requirement is merely that the two classification characteristics: gender and dieter are not associated.

For example, suppose we knew probabilities P, Q, p, q with $P+Q=p+q=1$ such that (male dieter, male non-dieter, female dieter, female non-dieter) had respective probabilities (Pp, Pq, Qp, Qq) for each individual encountered under our sampling procedure. The next step is to calculate the exact probability of any arrangement of these teenagers into the four cells of the table, but Fisher's exact test showed that to generate a significance level, we need consider only the cases where the marginal totals are the same as in the observed table, and among those, only the cases where the arrangement is as extreme as the observed arrangement, or more so. In this example, there are 11 such cases. Of these only one is more extreme in the same direction as our data:

Table 3. The 2*2 Contingency Table for the Sample Considering the Marginal Totals

	Men	Women	*Row total*
Dieting	*0*	*10*	*10*
Non-dieting	*12*	*2*	*14*
Column total	*12*	*12*	*24*

So the probability is $p = \frac{\binom{10}{0}\binom{14}{12}}{\binom{24}{12}} \approx 0.000033652$

In order to calculate the significance of the observed data, i.e. the total probability of observing data as extreme or more extreme if the null hypothesis is true, we have to calculate the values of p for both these tables, and add them together. This gives a one-tailed test, with p approximately 0.001346076 + 0.000033652 = 0.001379728. This value can be interpreted as the sum of evidence provided by the observed data for the null hypothesis (that there is no difference in the proportions of dieters between men and women). The smaller the value of p, the greater the evidence for rejecting the null hypothesis; so here the evidence is strong that men and women are not equally likely to be dieters.

For a two-tailed test we must also consider tables that are equally extreme, but in the opposite direction. An approach used by the Fisher' exact test is to compute the p-value by summing the probabilities for all tables with probabilities less than or equal to that of the observed table. In the example here, the 2-sided p-value is twice the 1-sided value—but in general these can differ substantially for tables with small counts, unlike the case with test statistics that have a symmetric sampling distribution.

4. Data Collection and Results Analysis

4.1. Questionnaire Design

Considering the differences among B2C, C2C and B2B e-commerce, and our research is focus on B2C e-commerce in China, the top 10 B2C e-commerce websites in retail market shown in table 4 are selected based on the transaction size.

Table 4. Top 10 B2C e-commerce Websites in Retail Market in China

No.	E-Commerce Website	Transaction Proportion (%)
1	Tmall (www.tmall.com)	52.1
2	Jingdong (www.jd.com)	22.3
3	Suning (www.suning.com)	3.6
4	Tencent (www.wanggou.com)	3.3
5	Vancl (www.vancl.com)	2.7
6	Amazon(www.amazon.com.cn)	2.3
7	Coo8 (www.coo8.com)	1.4
8	Dangdang (www.dangdang.com)	1.2
9	Yixun (www.51buy.com)	0.6
10	Newegg (www.newegg.com.cn)	0.3

A pre-designed observation sheet is used to collect all necessary data from these e-commerce websites. Three raters are participated to make an appropriate rating, and the selected items from all websites are rated with the widely used Little Scale, *i.e.*, from a scale of 1 (being the worst) to 5 (meaning excellent) accordingly. The specific factors that may have high influence on the online performance are listed in Table 5.

Table 5. The Factors may have High Influence on the Online Performance

Goal	Criteria	Sub-Criteria
The performance of the e-commerce websites	Website design	OC_1 Color assortment OC_2 Website structures OC_3 Visual attraction OC_4 Multi-media OC_5Security OC_6User friendly of the structure
	Transmission speed	OC_7 Average leadtime of main page OC_8 Average leadtime of main tab on the main page OC_9Problems with opening the main page
	Popularity	OC_{10} Traffic ranking OC_{11}Daily pageviews per user for this website OC_{12}Daily time on site
	Information quantity	OC_{13} Product categories OC_{14}Multi-restriction search OC_{15}Selectivity of similar products OC_{16} Product Introduction OC_{17} Buyers' Evaluation OC_{18}Payment OC_{19}Track orders
	Service	OC_{20}Logistic speed OC_{21}Free return OC_{22}Online seller

4.2. GRA

As shown in Table 5, there are twenty-two original criteria, so GRA is employed for the representative selection. Grey Correlation matrix is derived from the DPS 9.0 (software which can determine the grey correlation matrix) as below:

$$R_1 = \begin{bmatrix} 1.0000 & 0.3876 & 0.4199 & 0.4000 & 0.3423 & 0.4337 \\ 0.4446 & 1.0000 & 0.4877 & 0.3289 & 0.4530 & 0.4511 \\ 0.4587 & 0.4541 & 1.0000 & 0.2701 & 0.2620 & 0.4800 \\ 0.4701 & 0.3221 & 0.3148 & 1.0000 & 0.3881 & 0.3340 \\ 0.3585 & 0.4112 & 0.2382 & 0.3134 & 1.0000 & 0.3246 \\ 0.4063 & 0.3612 & 0.4215 & 0.2337 & 0.2836 & 1.0000 \end{bmatrix}$$

$$R_2 = \begin{bmatrix} 1.0000 & 0.4162 & 1.0000 \\ 0.4325 & 1.0000 & 0.4083 \\ 1.0000 & 0.3999 & 1.0000 \end{bmatrix} \quad R_3 = \begin{bmatrix} 1.0000 & 0.6127 & 0.5168 \\ 0.5154 & 1.0000 & 0.5393 \\ 0.5133 & 0.6187 & 1.0000 \end{bmatrix}$$

$$R_4 = \begin{bmatrix} 1.0000 & 0.5546 & 0.2405 & 0.3435 & 0.8588 & 0.5298 & 0.5298 \\ 0.4467 & 1.0000 & 0.2025 & 0.4098 & 0.4533 & 1.0000 & 1.0000 \\ 0.2083 & 0.2220 & 1.0000 & 0.3599 & 0.2172 & 0.2191 & 0.2220 \\ 0.3445 & 0.4847 & 0.3900 & 1.0000 & 0.3752 & 0.4550 & 0.4550 \\ 0.8697 & 0.4885 & 0.2097 & 0.3266 & 1.0000 & 0.4789 & 0.4853 \\ 0.4594 & 1.0000 & 0.2060 & 0.4067 & 0.4533 & 1.0000 & 1.0000 \\ 0.4759 & 1.0000 & 0.2019 & 0.4013 & 0.4533 & 1.0000 & 1.0000 \end{bmatrix}$$

$$R_5 = \begin{bmatrix} 1.0000 & 0.3569 & 0.2606 \\ 0.3689 & 1.0000 & 0.1853 \\ 0.2818 & 0.1853 & 1.0000 \end{bmatrix}$$

According to the above matrices and the definitions described earlier, the measures can be grouped into several clusters by threshold value r = 0.60. The classification result is shown in Table 6, and the representative criteria are identified as shown in Table 7.

Table 6. The Classification of the Representative Criteria

Aspects	Criteria with each cluster	Representative criteria
Website design	OC_1 OC_2 OC_3 OC_4 OC_5 OC_6	OC_1 OC_2 OC_3 OC_4 OC_5 OC_6
Transmission speed	OC_7 , OC_9 OC_8	OC_7 OC_8
Popularity	OC_{10} , OC_{11} , OC_{12}	OC_{12}
Information quantity	OC_{13} , OC_{17} OC_{14} , OC_{18},OC_{19} OC_{15} OC_{16}	OC_{13} OC_{14} OC_{15} OC_{16}
Service	OC_{20} OC_{21} OC_{22}	OC_{20} OC_{21} OC_{22}

Table 7. The Representative Factors may have High Influence on the Online Performance

Goal	Criteria	Sub-Criteria
The performance of the e-commerce websites	Website design	C_1 Color assortment C_2 Website structures C_3 Visual attraction C_4 Multi-media C_5Security C_6User friendly of the structure
	Transmission speed	C_7 Average leadtime of main page C_8 Average leadtime of main tab on the main page
	Popularity	C_9Daily time on site

	Information quantity	C_{10}Product categories C_{11}Multi-restriction search C_{12}Selectivity of similar products
	Service	C_{13}Logistic speed C_{14}Free return C_{15}Online seller

4.3. Fisher's Exact Test

The website design related factors are taken for example to show the Fisher's exact test, and the hypotheses and the Fisher's exact test process are as follows:

Hypothesis-1(a): Color assortment (C1) has a significant influence on online performance

Hypothesis-1(b): Color assortment (C1) has a lower influence on online performance

Table 7. Online Performance* Color Assortment (C1) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	24.795a	18	.131	.111		
Likelihood Ratio	26.946	18	.080	.086		
Fisher's Exact Test	21.531			.086		
Linear-by-Linear Association	1.955b	1	.162	.166	.092	.001
N of Valid Cases	30					

a. 30 cells (100.0%) have expected count less than 5. The minimum expected count is .20.

b. The standardized statistic is 1.398.

As shown in Table 7, the value of Fisher's Exact Test is 21.531, Exact Sig.(2-sided) is 0.086, which is greater than 0.05, therefore Hypothesis-1(a) is rejected with significant level of 5%, which means that color assortment has a lower influence on online performance.

Hypothesis-2(a): Website structures (C2) has a significant influence on online performance

Hypothesis-2(b): Website structures (C2) has a lower influence on online performance

Table 8. Online Performance * Website Structures (C2) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	85.833a	36	.000	.000		
Likelihood Ratio	68.840	36	.001	.000		
Fisher's Exact Test	52.871			.000		
Linear-by-Linear Association	5.986b	1	.014	.012	.006	.000
N of Valid Cases	30					

a. 50 cells (100.0%) have expected count less than 5. The minimum expected count is .10.

b. The standardized statistic is 2.447.

As shown in Table 8, the value of Fisher's Exact Test is 52.871, Exact Sig.(2-sided) is 0.000, lower than 0.05, therefore Hypothesis-2(a) is accepted with significant level of 5%, which means that website structures has a significant influence on online performance.

Hypothesis-3(a): Visual attraction (C3) has a significant influence on online performance

Hypothesis-3(b): Visual attraction (C3) has a lower influence on online performance

Table 9. Online performance * Visual Attraction (C3) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	31.667a	18	.024	.013		
Likelihood Ratio	38.600	18	.003	.013		
Fisher's Exact Test	24.421			.013		
Linear-by-Linear Association	6.666b	1	.010	.009	.004	.000
N of Valid Cases	30					

a. 30 cells (100.0%) have expected count less than 5. The minimum expected count is .90.

b. The standardized statistic is 2.582.

As shown in Table 9, the value of Fisher's Exact Test is 24.421, Exact Sig.(2-sided) is 0.013, lower than 0.05, therefore Hypothesis-3(a) is accepted with significant level of 5%.

Hypothesis-4(a): Multi-media (C4) has a significant influence on online performance

Hypothesis-4(b): Multi-media (C4) has a lower influence on online performance

Table 10. Online Performance * Multi-media (C4) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	40.000a	27	.051	.035		
Likelihood Ratio	43.646	27	.022	.021		
Fisher's Exact Test	31.816			.021		
Linear-by-Linear Association	5.586b	1	.018	.016	.008	.000
N of Valid Cases	30					

a. 40 cells (100.0%) have expected count less than 5. The minimum expected count is .20.

b. The standardized statistic is 2.363.

As shown in Table 10, the value of Fisher's Exact Test is 31.816,Exact Sig.(2-sided) is 0.021, lower than 0.05, therefore Hypothesis-4(a) is accepted with significant level of 5%, which means that website structures has a significant influence on online performance.

Hypothesis-5(a): Security (C5) has a significant influence on online performance

Hypothesis-5(b): Security (C5) has a lower influence on online performance

Table 11. Online Performance * Security (C5) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	60.000a	18	.000	.000		
Likelihood Ratio	56.601	18	.000	.000		
Fisher's Exact Test	36.917			.000		
Linear-by-Linear Association	1.050b	1	.305	.304	.147	.002
N of Valid Cases	30					

a. 30 cells (100.0%) have expected count less than 5. The minimum expected count is .30.

b. The standardized statistic is 1.025.

As shown in Table 11, the value of Fisher's Exact Test is 36.917, Exact Sig.(2-sided) is 0.000, lower than 0.05, therefore Hypothesis-5(a) is accepted with significant level of 5%.

Hypothesis-6(a): User friendly of the structure (C6) has a significant influence on online performance

Hypothesis-6(b): User friendly of the structure (C6) has a lower influence on online performance

Table 12. Online Performance * User friendly of the Structure (C6) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	73.846a	45	.004	.001		
Likelihood Ratio	60.238	45	.064	.003		
Fisher's Exact Test	50.814			.003		
Linear-by-Linear Association	6.200b	1	.013	.011	.005	.000
N of Valid Cases	30					

a. 60 cells (100.0%) have expected count less than 5. The minimum expected count is .10.

b. The standardized statistic is 2.490.

As shown in Table 12, the value of Fisher's Exact Test is 50.814, Exact Sig.(2-sided) is 0.003, lower than 0.05, therefore Hypothesis-6(a) is accepted with significant level of 5%, which means that user friendly of the structure has a significant influence on online performance.

5. Conclusions

This paper is an attempt to identify the key factors affecting the online performance of the B2C e-commerce companies in retail market in China. The primary data for this research are collected through a questionnaire, and GRA and Fisher's exact test are applied to identify the criteria of online performance impact analysis. The results could be the guideline for the e-commerce companies in terms of improving their performance. According to the results of the analysis, the main factors affecting online performance are shown in Table 13:

Table 13. The Analysis Result of the Main Factors of the Online Performance

Criteria	Sub-Criteria	Exact Sig.(2-sided)
Website design	C_2 Website structures C_3 Visual attraction C_4 Multi-media C_5Security C_6User friendly of the structure	*0.000* *0.013* *0.021* *0.000* *0.003*
Transmission speed	C_7 Average leadtime of main page C_8Average leadtime of main tab on the main page	*0.026* *0.035*
Popularity	C_9Daily time on site	*0.001*
Information quantity	C_{10}Product categories C_{12}Selectivity of similar products	*0.005* *0.003*
Service	C_{13}Logistic speed C_{15}Online seller	*0.040* *0.002*

Based on the results of this research, our recommendations for improving the online performance of the B2C e-commerce companies are: (1) improving the website structure, and security; (2) shortening the delivery time and the respond time; and (3) enriching personalization and selectivity.

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