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Main Factors Affecting the Online Service Satisfaction-an Empirical Study in China

YanJu Li

HeNan University of Animal Husbandry and Economy
No.2 of YingCai Road, ZhengZhou, HeNan, China
liyanju69@126.com

Abstract

Online service quality has a significant influence on many important aspects of electronic commerce (e-commerce). However, there are few quantitative studies on the investigation of the main affecting factors of the online service quality 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 Fisher's exact test is applied to identify the main affecting factors of online service satisfaction. The results could be the guideline for the e-commerce companies in terms of improving their online service.

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

1. Introduction

As the development of the internet, there are increasingly users 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. The online service quality is becoming increasing important as the e-commerce companies deliver an expanding array of services through the internet, in which the websites clearly emerge as a critical channel for e-commerce companies. Online service quality has a significant influence on many aspects of the e-commerce, which include the consumer trust on the e-commerce companies (Gefen, 2002; Hwang and Kim, 2007; Hsu, 2008); attitude toward e-shopping (Ha and Stoel, 2009); willingness to pay more (Lee and Lin, 2005; Cristobal *et al.*, 2007; Ho and Lee, 2007); site loyalty intentions (Ho and Lee, 2007; Yoo and Donthu, 2001); user online satisfaction (Lee and Lin, 2005; Cristobal *et al.*, 2007; Ho and Lee, 2007). Online e-service has been increasingly recognized as the most important determinant of long-term performance and success for online retailers (Zeithaml *et al.*, 2002; Santos, 2003; Wolfinbarger and Gilly, 2003; Holloway and Beatty, 2003; Fassnacht and Koese, 2005).

It is necessary for the e-commerce companies to identify customers' needs, wants, and preferences in order to deliver high quality service performance (Howard and Worboys, 2003). However, the service environment differs a lot between the physical stores and online storefronts, so it is necessary to study the main factors affecting the online service satisfaction of the e-commerce websites.

This paper is an attempt to identify the main factors affecting online service quality for the e-commerce companies in China, which could be the guideline for the development of the companies. 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 Fisher's exact test which is employed in this research. Section 4 discusses the main factors

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that have an impact on the online service in China. In the last section, the related managerial implications of this research are discussed.

2. Literature Review

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. The e-service quality research is still in a primary condition compared with the face-to-face services (Serkan *et al.*, 2010).

A series of researches about web site quality measurement (Loiacono *et al.*, 2002; Yoo and Donthu, 2001), online service quality evaluation (Bauer *et al.*, 2006; Parasuraman *et al.*, 2005; Zeithaml *et al.*, 2000), or e-retailing quality appraisal (Wolfinbarger and Gilly, 2003) are studied in the related researches. 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 (Nelson *et al.*, 2005; Wixom and Todd, 2005). Table 1 summarizes the related research results:

Table 1. Online Service Quality Scales in Prior Related Research

Article	System related	Service related
Zeithaml et al. (2000)	Access, ease of navigation, flexibility, reliability, price knowledge, aesthetics, efficiency, personalization, privacy.	Responsiveness, assurance
Francis and White (2002)	Product attribute, functionality, ownership conditions, security	Delivery, customer service
Loiacono et al. (2002)	Appeal, response time, flow, image, operations, better than alternatives, innovativeness, interactivity, trust	
Barnes & Vidgen (2002)	Usability, design	Empathy, trust
Wolfinbarger & Gilly (2003)	Website design, privacy	Fulfillment/reliability, customer service
Parasuraman et al. (2005)	Efficiency, availability, privacy	Fulfillment
Parasuraman et al. (2005)		Compensation, responsiveness contract
Bauer et al. (2006)	Reliability, process, functionality/design	Responsiveness, enjoyment
Yoo & Donthu (2001)	Ease of use, aesthetic design, reliability, tangibles	Responsiveness
Aldwani & Palvia (2002)	Technical adequacy, specific content, content quality, web appearance	
Janda et al. (2002)	Access, security, information	Sensation
Ranganathan & Ganapathy (2002)	Information content, design, security, privacy	
Yang & Jun (2002)	Reliability, access, ease of use, personalization, security	Responsiveness
Cai & Jun (2003)	Website design/content	Trustworthiness, prompt/reliable service,

		communication
Gounaris & Dimitriadis (2003)		Customer care and risk reduction benefit, information benefit, interaction facilitation
Jun et al. (2004)	Ease of use, attentiveness, access, security, credibility	Reliable/prompt responses
Kim & Stoel (2004)	Web appearance, entertainment, information fit-to-task, transaction capacity	Response time, trust
Lee & Lin (2005)	Website design, reliability, personalization	Responsiveness, trust
Parasuraman et al. (2005)	Efficiency, system availability, privacy	Fulfillment
Yang et al. (2005)	Usability, usefulness of content, adequacy of information, accessibility	Interaction
Collier and Bienstock (2006)	Functionality, information accuracy, design, privacy, ease of use, order condition, order accuracy , procedural fairness, outcome fairness	Timeliness, interactive fairness
Ibrahim et al. (2006)	Convenience/accuracy, accessibility/reliability, good queue management, personalization	Friendly/responsive customer service, targeted customer service
Cristobal et al. (2007)	Web design, assurance, order management	Customer service
Ho & Lee (2007)	Information quality, security, website functionality	Customer relationships, responsiveness
Sohn & Tadisina (2008)	Trust, ease of use, website content and functionality, reliability	Customized communication, speed of delivery
Wang et al. (2010)	Reliability, competence, ease of use, product portfolio, security	Responsiveness, satisfaction
Ding et al. (2011)	Perceived control	Service convenience, customer service, fulfillment

3. Methodology

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 2. 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 3. 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 4. 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

The specific factors that may have high influence on the online service satisfaction are listed in Table 5. The questionnaire is designed based on these factors, and the respondents are required to evaluate the related situations based on Five-point scale method (1 indicates the worst evaluations, while 5 indicates the best evaluation).

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

Goal	Aspects	Criteria
The factors may have high influence on the 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

Considering the differences among B2C, C2C and B2B e-commerce, and our research is focus on B2C e-commerce websites in China, the 18 B2C e-commerce websites in retail market shown in table 6 are selected based on the user coverage.

Table 6. 18 B2C e-commerce Websites in Retail Market in China

No.	E-Commerce Website	No. of users (per million)
1	Tmall	9010
2	Jingdong Mall	6940
3	Tencent	3930
4	Amazon	3450
5	Handle group buying	2580
6	Dangdang	2160
7	Vancl	2160
8	Full King	1290
9	No.1	1050
10	F group buying	770
11	Yixun	760
12	Moonbasa	700
13	Letao	640
14	Newegg	600
15	M 18	570
16	Ok buy	560
17	VIP shop	490
18	M baobao	450

The respondents are required to identify 1-5 e-commerce websites that they are most familiar with and evaluate the related aspects in terms of the e-service quality. In this survey, 50 questionnaires were sent out, 48 were returned and 40 were valid.

4.2. Internal Consistency Test

In statistics and research, internal consistency is typically a measure based on the correlations between different items on the same test (or the same subscale on a larger test). It measures whether several items that propose to measure the same general construct produce similar scores. Cronbach's α is used to measure the internal consistency of the data in this research. It was first named alpha by Lee Cronbach in 1951, and it is widely used in the social sciences, business, nursing and other disciplines.

Cronbach's α is defined as:

$$\alpha = \frac{K}{K-1}(1 - \frac{\sum S_i^2}{S_T^2})$$

Where K is the number of the components (K -items), S_T^2 is the variance of the observed total test scores, and S_i^2 is the variance of component i for the current samples.

The Cronbach's α is 0.6521 in this research which means that the internal consistency is acceptable.

4.3. Fisher's Exact Test

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

Hypothesis-1(a): Efficiency (C_1) has a significant influence on online service satisfaction

Hypothesis-1(b): Efficiency (C_1) has a lower influence on online service satisfaction

Table 7. Online Service Satisfaction* Efficiency (C_1) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	19.009a	4	.001	.001
Likelihood Ratio	21.765	4	.000	.000
Fisher's Exact Test	17.068			.001
N of Valid Cases	45			

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 2.67.

As shown in Table 7,the value of Fisher's Exact Test is 17.068,Exact Sig.(2-sided) is 0.001,which is lower than 0.05,therefore Hypothesis-1(a) is accepted with significant level of 5%,which means that efficiency has a significant influence on online service satisfaction.

Hypothesis-2(a): Ease of navigation (C_2) has a significant influence on online service satisfaction

Hypothesis-2(b): Ease of navigation (C_2) has a lower influence on online service satisfaction

Table 8. Online Service Satisfaction* Ease of Navigation (C_2) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	14.849a	6	.021	.014
Likelihood Ratio	17.231	6	.008	.012
Fisher's Exact Test	13.223			.016
N of Valid Cases	45			

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .53.

As shown in Table 8, the value of Fisher's Exact Test is 13.223,Exact Sig.(2-sided) is 0.016,lower than 0.05,therefore Hypothesis-2(a)is accepted with significant level of 5%,which means that ease of navigation (C_2) has a lower influence on e-service satisfaction.

Hypothesis-3(a): Flexibility (C_3) has a significant influence on online service satisfaction

Hypothesis-3(b): Flexibility (C_3) has a lower influence on online service satisfaction

Table 9. Online Service Satisfaction * Flexibility (C_3) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	7.055a	4	.133	.134
Likelihood Ratio	9.650	4	.047	.079
Fisher's Exact Test	7.479			.101
N of Valid Cases	45			

a. 4 cells (44.4%) have expected count less than 5. The minimum expected count is 2.93.

As shown in Table 9, the value of Fisher's Exact Test is 7.479,Exact Sig.(2-sided) is 0.101,greater than 0.05,therefore Hypothesis-3(a)is refused.

Hypothesis-4(a): Reliability (C_4) has a significant influence on online service satisfaction

Hypothesis-4(b): Reliability (C_4) has a lower influence on online service satisfaction

Table 10. Online Service Satisfaction * Reliability (C_4) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	13.668a	4	.008	.007
Likelihood Ratio	15.280	4	.004	.008
Fisher's Exact Test	12.444			.009
N of Valid Cases	45			

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 2.40.

As shown in Table 10,the value of Fisher's Exact Test is 12.444,Exact Sig.(2-sided) is 0.009,lower than 0.05,therefore Hypothesis-4(a)is accepted.

Hypothesis-5(a): Price knowledge (C_5) has a significant influence on online service satisfaction

Hypothesis-5(b): Price knowledge (C_5) has a lower influence on online service satisfaction

Table 11. Online Service Satisfaction * Price Knowledge (C_5) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	14.583a	8	.068	.032
Likelihood Ratio	15.299	8	.054	.047
Fisher's Exact Test	12.749			.040
N of Valid Cases	45			

a. 12 cells (80.0%) have expected count less than 5. The minimum expected count is .27.

As shown in Table 11, the value of Fisher's Exact Test is 12.749, Exact Sig.(2-sided) is 0.40,greater than 0.05,therefore Hypothesis-5(a)is rejected with significant level of 5%.

Hypothesis-6(a): Aesthetics (C_6) has a significant influence on online service satisfaction

Hypothesis-6(b): Aesthetics (C_6) has a lower influence on online service satisfaction

Table 12. Online Service Satisfaction * Aesthetics (C_6) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	7.939a	4	.094	.092
Likelihood Ratio	8.444	4	.077	.106
Fisher's Exact Test	6.631			.134
N of Valid Cases	45			

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 1.60.

As shown in Table 12, the value of Fisher's Exact Test is 6.631, Exact Sig.(2-sided) is 0.134,greater than 0.05,therefore Hypothesis-6(a)is rejected with significant level of 5%.

Hypothesis-7(a): Personalization (C_7) has a significant influence on online service satisfaction

Hypothesis-7(b): Personalization (C_7) has a lower influence on online service satisfaction

Table 13. Online Service Satisfaction * Personalization (C_7) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	18.289a	6	.006	.002
Likelihood Ratio	21.148	6	.002	.001
Fisher's Exact Test	16.569			.002
N of Valid Cases	45			

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .27.

As shown in Table 13, the value of Fisher's Exact Test is 16.569, Exact Sig.(2-sided) is 0.002,lower than 0.05,therefore Hypothesis-7(a)is accepted with significant level of 5%.

Hypothesis-8(a): Ownership conditions (C_8) has a significant influence on online service satisfaction

Hypothesis-8(b): Ownership conditions (C_8) has a lower influence on online service satisfaction

Table 14. Online Service Satisfaction * Ownership Conditions (C_8) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	7.121[a]	8	.524	.571
Likelihood Ratio	8.927	8	.348	.445
Fisher's Exact Test	6.999			.560
N of Valid Cases	45			

a. 13 cells (86.7%) have expected count less than 5. The minimum expected count is .27.

As shown in Table 14, the value of Fisher's Exact Test is 6.999, Exact Sig.(2-sided) is 0.560,greater than 0.05,therefore Hypothesis-8(a)is refused with significant level of 5%.

Hypothesis-9(a): Ease of use (C_9) has a significant influence on online service satisfaction

Hypothesis-9(b): Ease of use (C_9) has a lower influence on online service satisfaction

Table 15. Online Service Satisfaction * Ease of Use (C_9) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	15.949a	4	.003	.002
Likelihood Ratio	15.574	4	.004	.006
Fisher's Exact Test	13.405			.004
N of Valid Cases	45			

a. 5 cells (55.6%) have expected count less than 5. The minimum expected count is 1.33.

As shown in Table 15, the value of Fisher's Exact Test is 13.405, Exact Sig.(2-sided) is 0.004,lower than 0.05,therefore Hypothesis-9(a) is accepted with significant level of 5%.

Hypothesis-10(a): Speed (C_{10}) has a significant influence on online service satisfaction

Hypothesis-10(b): Speed (C_{10}) has a lower influence on online service satisfaction

Table 16. Online Service Satisfaction * Speed (C_{10}) Impact Analysis

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	22.068a	8	.005	.002
Likelihood Ratio	25.062	8	.002	.001
Fisher's Exact Test	20.519			.001
N of Valid Cases	45			

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is .27.

As shown in Table 16, the value of Fisher's Exact Test is 20.519, Exact Sig.(2-sided) is 0.001,lower than 0.05,therefore Hypothesis-10(a) is accepted with significant level of 5%.

5. Conclusions

This paper is an attempt to identify the key factors affecting the online service quality in China. The primary data for this research are collected through a questionnaire, and Fisher's exact test is applied to identify the criteria of online service quality impact analysis. The results could be the guideline for the e-commerce companies in terms of improving their service.

According to the results of the analysis, the main factors affecting online service satisfaction are shown in Table 17:

Table 17. The Analysis Result of the Main Factors of the Online Service Satisfaction

Aspect	Main factor	Exact Sig. (2-sided)
A_1System related	C_1 Efficiency	0.001
	C_2 Ease of navigation	0.016
	C_4 Reliability	0.009
	C_7 Personalization	0.002
	C_9 Ease of use	0.004
	C_{10} Speed	0.001
A_2 Service related	C_{11}Responsiveness	0.028
	C_{12} Assurance	0.005
	C_{13}Delivery	0.04
	C_{14} Customer service	0.015

Based on the results of this research, our recommendations for improving the online service of the e-commerce companies are: (1) improving the efficiency, reliability and speed of the respond; (2) shortening the delivery time; and (3) enriching personalization and customer service.

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Author

YanJu Li, female, she was born on 10 Oct, 1969, now she is an associate Professor in HeNan University of Animal Husbandry and Economy, and her research direction is E-Business.