The Comparative Analysis of Online Shopping Information Platform's Security Based on Customer Satisfaction

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***Abstract*—With the massive expansion of Internet and e-commerce technology, Internet platform is providing a lot of services and advantages for online business, especially for online shopping portal. As a result of the Internet, online shopping has expanded in businesses more effectively and online services are collaborating with customers and other associations. For improving online shopping information platform's security, customer satisfaction is one of the most fundamental factors. This paper constructs the measurement of four-dimensional models that are appropriate for measuring customer satisfaction of online shopping information platform's security. This paper also conducts the factor and multiple regression analysis to verify the measurement model. By using questionnaires survey and analysis from the groups of Hohai University students, this research provides suggestions for the development of large online shopping portal and will help to improve customer satisfaction on the security of the online shopping information platforms.**

Keywords—Customer Satisfaction; Platform Security; Online Shopping; Comparative Analysis; Customer Perception

I. INTRODUCTION

In the rapid improvement of the online market, numerous consumers are interested in online marking as a new service mode. In order to fulfill the customer demand, the online shopping portals have developed many online purchasing systems and online payment service systems. In those systems, the user can log in the online portal on the internet to enjoy the online purchasing through the web and mobile application. According to the report of user feedback, technically a well-developed information platform's security is safe enough to ensure customers accounts information for accepting the real challenge of the online shopping payment platform.

The online shopping portal finds few emerging contents: customer satisfaction, service quality, software performance, security, and product tracking. The preventions of the information security problems need to use software-based systems during online purchasing [1]. The behavior of the internet creates opportunities for hackers and other tricksters who would take benefit of companies and vulnerable consumers. Online shopping companies ensure customers information and also secure their personal data when they submit an order or complete a purchase. It may be best for an online business company to install the most up-to-date encryption and secure technology to maintain customers personal data. They also defend the online payment portal from hacking, viruses, malwares and anything that could prevent the online portal from performing perfectly.

China is one of the largest online products sellers in the world. It has some popular online shopping portals such as Alibaba (taobao.com, tmall.com), jd.com etc. These online shopping portals transfer a huge amount of money every day. Last year in October-December 2015, the day average of products selling was 1.2 billion USD by Alibaba (taobao.com, tmall.com) and 98 million USD by Jd.com. Therefore, online shopping portal information security has major responsibilities for online business.

In this paper, by using the satisfaction of domestic and foreign students during online shopping in Alibaba (taobao.com, tmall.com), we have designed a four-dimensional model with eight sub-factors, based on the influence factors of online shopping information platform's security. The result of the empirical analysis of this paper is able to give an idea about how to improve the quality of the online shopping portal information platform's security, from the customer's point of view. The increase of customer satisfaction improves the quality of the online portals, which increases the competitiveness of rapid development in online network market correspondingly.

The rest of the paper is organized as follows: Section II contains the related work; Section III explains the research model and hypothesis; Section IV presents the empirical analysis and finally section V concludes the paper.

II. RELATED WORK

In the area of online shopping customer satisfaction part, many domestic and foreigner researchers proposed several approaches. Oliver (1980) defined that customer satisfaction is the realization caused by a customer after using a product or service. Customer perception service quality is the central of assessment, while customer's satisfaction is connected with individual transaction [2]. Ma (2012) purposed a research

method to analyze the serviceability and reliability factors for Internet banking customer satisfaction in China. Also, his papers explain the relationship among serviceability, reliability and customer satisfaction, and measures internal consistency of the variables for Internet banking customer satisfaction [3]. Hizza Bt. HILA LUDIN (2014) has examined some factors that influences customer satisfaction, and how customer satisfaction afterward impacts on loyalty towards online shopping from both web and mobile application among young customers. Finally, he proved that customer's satisfaction does emphatically impact on e-loyalty. The findings exposed that a web application is developed and the security was significant towards the customers satisfaction [4]. Ren (2016) proposed a model to measure the loyalty by using an efficient B2C distribution platform. He has analyzed his developed model and calculated the cooperation performance between E-Commerce and Sports Commodity based on Online Shopping Strategy [5]. Christian Schaupp (2005) has conducted an empirical analysis on consumers affections based on the data collected from young customers. Results showed that the three most important factors for online user satisfaction to the consumers were: privacy product selling, online marking and information security [6]. Ting et al. (2012) developed a seven-dimension model to measure the Internet Banking information security product service quality, customer satisfaction and customer loyalty. He has applied the factor analysis, coefficient and multiple regression method to compare the relationship between perception service quality, customer satisfaction, and customer loyalty of the Internet banking information security product [7]. Abraheem Shlash Mohammad (2011) proposed a model of service quality and its effect on customer satisfaction from the perspective of a user of an online bank in Jordan. He calculated the service quality based on SERVQUAL mode that was developed by Parasuraman et al. (1988) [8].

Parasuraman et al. (1985, 1988) proposed a famous ten dimensions service quality model for customer's satisfaction. The factors are service reliability, responsiveness, proximity, safety, manners, communication, credibility, ability, tangible and understanding [9]. Based on a specific condition, Bahla et al. (2000) developed a seven- dimensional model according to the bank of Canada. His seven- factors are: effectiveness, trust, price, received capacity, reliability, tangible capital and quality. All these factors are suitable for measuring the service quality of the bank [10]. Yang et al. (2001) took the products of the online pharmacies as the study materials. The outcomes of this research present usability, accuracy, time, data quality web content and assurance as factors. These six factors have an effect on E-commerce service based on the customer perception of E-commerce service quality [11]. Fuchen (2004) proposed the SERVQUAL model using BSQM scale and designed seven- factors which are reliability, safety, assurance, individuation, tangible, assets, accessibility and cost [12]. The experimental research of Yini et al. (2007) found important influence on online bank customers satisfaction based on five factors which are: environment, tracking service, financial products, bank image and service quality [13]. Based on the analysis of the related work, this paper mainly selected the service quality, software performance, security, and product tracking as the main factors; and usability, reliability, responsiveness, information quality, platform trust, privacy, tracking and service as the sub-factors for measuring the customer satisfaction of online shopping information platform's security.

III. RESEARCH MODEL AND HYPHOTHESIS

A. Proposed Model

In this paper, information platform is a customer's personal data part that is used when the customer uses online payment during shopping. The online price payment platform has some features, which are highly technical, short process and strong privacy [14]. Based on the customer satisfaction measurement process, we select several factors, which are associated with the information technology and e-service. According to the domestic status, this research uses different factors to measure customer satisfaction. We have measured the customer satisfaction from the service quality, software performance, security and product tracking of the online shopping information platform security. We have proposed four main factors and eight sub-factors in our model, which is shown in Fig. 1.

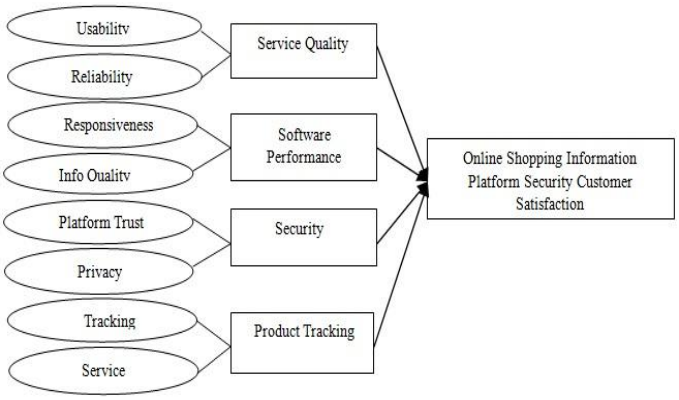

Fig.1. Conceptual Model of Online Shopping Information Platform's Security Customer Satisfaction

B. Hypothesis

Based on the above proposed model and analysis of the related work, we have designed the following research hypothesis for the customer satisfaction of the online marketing information platform's security. Our designed hypothesis is shown in Table I.

TABLE I. HYPOTHESIS

Hypothesis	Hypothesis Contents
H:1	The online shopping information platform security customer satisfaction and service quality has significant effect.
H:1.1	Usability has significant effect on user satisfaction towards online shopping information security platform.
H:1.2	Reliability has significant effect on user satisfaction towards online shopping information security platform
H:2	The online shopping information platform security customer satisfaction and software performance has significant effect
H:2.1	Responsiveness has significant effect on customer satisfaction towards online shopping information platform security.
H:2.2	Info Quality has significant effect on coustomer satisfaction towards online shopping information security platform.

H:3	The online shopping information security platform customer satisfaction and security has significant effect.
H:3.1	Trust has significant effect on customer satisfaction towards online shopping information security platform.
H:3.2	Privacy has significant effect on customer satisfaction towards online shopping information security platform.
H:4	The online shopping information security platform customer satisfaction and product tracking has significant effect.
H:4.1	Tracking has significant effect on customer satisfaction towards online shopping information security platform.
H:4.2	Service has significant effect on customer satisfaction towards online shopping information security platform.

IV. Empirical Analysis

A. The Questionnaire Design and Data Collection

The data are collected from the users who has account and experience in product purchasing from online market portals. In the formal format, this section is divided into two parts: personal information of the respondents and satisfaction questionnaire survey about the customers online shopping information platform's security. The first part, personal information of the respondents includes gender, age, educational level, student's category and frequency of online shopping; the second part, customers satisfaction survey about online shopping information platform's security includes four aspects- service quality, software performance, security and product tracking. The questionnaires were filled up by inviting university (Hohai University) friends (Chinese & foreigner), and through the network platform and e-mail system. In this analysis, we used the likert7 amount of points which starts from "strongly disagree" to "strongly agree" where the progressive degree is from 1 to 7 points. These degrees are used in the corresponding evaluation. Here, we are specifying the sample characteristics for accepting investigation which are shown in Table II.

TABLE II. Simple Characteristics Investigation

Indicators	Category Attribute	Percentage
Gender	Male	45.55%
	Female	55.45%
Age	Under age 18	2.61%
	18 to 25	61.03%
	26 to 30	24.90%
	30 and above	10.46%
Education	Undergraduate	67.91%
	Graduate	25.55%
	Doctoral students and above	6.54%
Student Category	Domestic	75.50%
	International	24.50%
Frequency of Online Shopping	At least once a week	44.55%
	1 to3 times a month	39.55%
	Once Every 2- 3 months	10.45%
	Once Every 4-6months	5.50%

As the research is about measuring customer satisfaction of online shopping information platform's security, we included customers from three most popular online shopping (tmall.com, taobao.com, JD.com) web and mobile application platform, which are used by chinese and foreigner students of Hohai University. After collecting the data, we have done the reliability analysis, factor analysis and multiple regression analysis by using SPSS software (23.0 versions) to test the value of signification between the variables. We have designed 20 questions for questionnaires survey content. We have released 135 questionnaires in hard copy and 115 questionnaires in soft copy thought E-mail to the students of Hohai University. An overall of 250 of these questionnaires were finished and used in data analysis reporting a feedback of 100 percent.

B. Reliability Analysis

Reliability mainly indicates the accuracy of the expression method and data [15]. To demonstrate the internal reliability, this study has executed Cronbach's Alpha test of reliability. This section focuses on the assessment of the reliability calculation of the project internal consistency with the exact coefficients. According to Nunnally (1978), Cronbach's alpha should be 0.700 or above. The Cronbach Alpha coefficients we get after the reliability analysis by the SPSS software are shown in Table III. From Table III, we can see that all the values of the reliability Cronbach Alpha coefficients are over 0.8, and the outcome achieved from the questionnaire survey is reliable and effective for internal consistency.

The analyzed Reliability of the individual scales is shown in Table III.

TABLE III. Reliability Coefficint

Variables	Number of Items	Reliability Coefficient (Cronbach Alpha)
Usability	4	.894
Reliability	3	.868
Responsiveness	3	.864
Info Quality	3	.904
Platform Trust	2	.837
Privacy	3	.878
Tracking	3	. 845
Service Capacity	2	.852
User Satisfaction	3	.912

C. Validity Analysis

The Factor Analysis, which is a data rebate approach, is generally used for determining the underlying dimensions in multivariate data analysis. The factor analysis was completed to extract all the highly interacted variables from the existing data file and replacing the remaining data with comparatively lower values of the variables. In this section, we used Kaiser-Meyer-Olkin (KMO) and Bartlett's test for factor analysis which examines the build validity of the questionnaires. With the variables KMO testing and Bartlett testing, the average value of KMO is .821 (greater than 0.7) and the significance level of sphericity of Bartlett test is 0.00 which expresses the gained data that are normally dispersed. We found the factors explained 82.1% of the variance from total variance in the factor analysis. We used the eight sub-factors including customer satisfaction for analyzing the factors where each factor is indicated by a unique code.

From Table IV, we can see that the factors load value of the model is greater than 0.3 after rotating, and all the measuring factor load is greater than 0.3.

TABLE IV. FACTOR ANALYSIS

Variables	Code	Values	Variables	Code	Values
Usability	US1	.700	Platform Trust	PT1	.884
	US2	.739		PT2	.884
	US3	.841	Privacy	PR1	.707
	US4	.763		PR2	.845
Reliability	REL1	.864		PR3	.860
	REL2	.839	Tracking	TR1	.662
	REL3	.850		TR2	.798
Responsiveness	RS1	.701		TR3	.832
	RS2	.827	Service Capacity	SC1	.871
	RS3	.855		SC2	.871
Info Quality	IQ1	.821	Customer Satisfaction	CS1	.838
	IQ2	.910		CS2	.908
	IQ3	.792		CS3	.901

D. Regression Analysis

Regression Analysis was involved in verifying the impact of four model factors on customer satisfaction. It is an effective approach to analyze the relationship between an individual dependent and various independent factors [16]. In this section, the analysis involves a multiple regression analysis to apply the model factors. This research sets the online shopping information platform's security based on customer satisfaction as the dependent variable [17]. The Predictors software performance, service quality, security and product tracking are set as the independent variable for the multiple regression analysis. The results of regression analysis are shown in Table V, Table VI and Table VII.

TABLE V. MODEL SUMMARY

Model	R	R Square	Adjusted R Square
1	.732	.536	.490

a. Dependent Variable: Customer Satisfaction
b. Predictors: (Constant): Service Quality, Software Performance, Security, Product Tracking

In order to analyze the impact factors of online shopping customer satisfaction, we calculated the overall customer satisfaction. Based on the simply detailed statistics of the multiple regression analysis, the overall regression is defined as follows:

Overall Customer Satisfaction, $X = \boldsymbol{\alpha} + \boldsymbol{\beta}_1(SQ) + \boldsymbol{\beta}_2(SP) + \boldsymbol{\beta}_3(SE) + \boldsymbol{\beta}_4(PT) + e$ .....(1)

here, Customer Satisfaction (X) is the dependent factor, and Service Quality (SQ), Software Performance (SP), Security (SE) and Product Tracking (PT) are the predictors of the regression equation of overall customer satisfaction.

From Table V, the value of R is 0.732. Therefore, 0.732 is used for the four factors namely service quality, software performance, security and product tracking. These four independent variables have a strong effect on the customer satisfaction. Also, here, the coefficient of the resolve value (i.e. the R-square (R^2)) is 0.536, which represents that 53.6% variation of the dependent variable (customer satisfaction) is due to the independent variables.

From Table VI, it is determined that the value of F is 11.553 and the level of significance is less than .05 ($p<.05$). From this analysis, we can see that the overall model was perfect and there was a statistically significant relation between model variables and customer satisfaction. Therefore, the analysis showed that independent variables have a significant impact on customer satisfaction of China's three most popular online market platforms. The following table shows the results from the regression analysis.

TABLE VI. ANOVA(B)

Model	Sum of Squares	Df	Mean Square	F	Sig
Regression	18.892	4	4.723	11.553	.000
Residual	16.352	246	.409		
Total	35.244	259			

In Table VII, unstandardized coefficients show how much the dependent variable changes with an independent variable. The beta coefficient shows how the model factors such as software performance, service quality, security and product tracking impact on the customer satisfaction of the online shopping information platform's security. From the analysis, it is found that the software performance (beta =.702, t=5.948, $p<0.05$) and product tracking (beta=.697, t=5.189, $p<0.05$) have significant impact on customer satisfaction, whereas, Security (beta =.609, t=3.189, $p<0.05$) and Service Quality (beta=.571, t=3.050, $p<0.05$) have a comparatively lower impact on customer satisfaction of the online platform's security. In the regression equation of our analysis, the Tolerance (t) of the model variables was not greater than 0.10 and a Variance Inflation Factor (VIF) was less than 10.

Table VII shows that every factor and customer satisfaction stands for significant relevance and the coefficients are positive. Therefore, the relationship between the factors indicates the positive correlativity. From equation (1), we found the overall customer satisfaction of the shopping information platform's security.

Overall Customer Satisfaction, X = 2.631 + .702(SQ) + .609 (SP) + .571(SE) + .697(PT)

Through the above research, we can conclude that the four influencing factors, from strong to weak, on customer satisfaction can be sorted as Service Quality > Product Tracking > Software Performance > Security.

TABLE VII. CORRELATION COEFFICIENTS ANALYSIS

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	*Sig.*	Collinearity Statistics	
						Tolerance (t)	*VIF*
	B	*Std. Error*	*Beta*				
(Constant)	2.631	.549		4.797	.000		
Soft-Performance	.526	.088	.702	5.948	.000	.832	1.202
Security	.261	.082	.609	3.189	.003	.318	3.144
Product Tracking	.240	.079	.697	5.189	.004	.331	3.022
Service Quality	.013	.064	.571	3.050	.001	.932	1.073

V. CONCLUSIONS

This study mainly investigates the customer satisfaction of online shopping information platform's security, which contains service quality, software performance, security and product tracking. According to the factors and the use of the regression analysis, we can conclude the research results as: The four-dimensional model and customer satisfaction of the online shopping information platform's security has a positive correlation. Among the four factors, the software performance has the greatest impact on the customer satisfaction, whereas product tracking, security and service quality have a comparatively lower impact. Since the competition in the online product marking sector is increasing drastically, the results of this research can help new online shopping portals in understanding customer concerns, which will also help them to get group of stable customers in a short period of time. For online shopping business companies, it is important to increase the quality of the platform's security of the software, and provide a safe and reliable software platform for the customers.

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