Original Research Article

Risk Perception & Trust towards E-Commerce in Bangladesh: Logistic Regression & Kano Model Approach

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Abstract

E-commerce or electronic commerce indicates such an industry where business activities take place over electronic systems. This is now a rapidly growing sector in Bangladesh which is influencing local and international trade in a greater extent. As e-commerce practicing is now a very common phenomenon in our daily life, it is important to understand the key issues in building relationships with customers on the internet. Trust is supposed to be the key to these relationships. This research identifies a number of key factors related to trust and risk perception of the customers in the context of e-commerce through binary logistic regression model. Cronbach's alpha is used to test the reliability of scale used in the questionnaire. Kano model analyzes the factors that might be concerned to upgrade the satisfaction level of the customers. The findings in this research suggest that customer's trust levels and risk perception are likely to be influenced by their age, experience of using internet, internet using purpose, and market orientation. Focusing on social risk, improving responsiveness towards customers, and ensuring technological security are the factors that mostly determine the customers' satisfaction to e-commerce.

Keywords: trustworthiness, risk perception, Cronbach's alpha, binary logistic regression, Kano model.

INTRODUCTION

Internet has become an important business platform for trading, distributing, and selling products and services. In this era of internet, e-commerce has been turned out into an entirely new level [1, 2]. E-commerce or electronic commerce means any type of business or commercial transaction that takes place via internet [3]. It works as a central issue in the global economy for doing business in new way [4]. Standing at the heart of new distribution channel, it supports online vendor to provide product and service that are fruitful and superior in many ways to traditional channel [5, 6].

E-commerce is an increasingly essential area in the developing countries for enhancing economic growth and welfare [7]. For the developing countries, it provides twofold opportunities, one is it enables developing country business to take part as vendors in international market, another is it permits them to buy necessary goods and services at least possible time from the developed world [8]. For this reason, developing countries are giving much attention to adopt e-commerce in their national trade strategies. UNCTAD survey on national e-strategies finds that a significant number of developing countries have included e-commerce in their national e-strategies and targeted some sectors for the development of internet based business [9].

Internet services are now very much available in Bangladesh [10]. In recent times, e-commerce has grown vastly Worldwide as well as in Bangladesh. Many Bangladeshi organizations are trying to build physical infrastructures to develop e-commerce and mimic e-commerce model from developed countries [11]. Bangladesh Government strongly supports the development of e-commerce and also it is viewed as a national trade strategy here [12]. The present Government is aiming at making digital Bangladesh. To fulfill the dream, the Government is initiating different e-commerce programs across the country [13]. Already

a promising start in e-commerce has been started here. For instance, mobile phone companies are using e-commerce in the form of flexi-load, bill pay services; banks are using e-commerce by online banking system, shopping malls are using it though buying and selling products through the credit card [14]. Moreover, ministry of commerce, ministry of planning, and ministry of information and communication are jointly promoting the e-commerce in Bangladesh.

Trust is an important concept to the development of business to customer (B2C) e-commerce. In fact, trust is a basic principle of every business relationship [14]. The most important long-term barrier for ascertaining the potential of internet marketing to consumers is the lack of trust of the customers, both in the honesty of the merchant's and merchant's competence to fill internet orders [15]. This study aims at addressing the key variables that affect the perception of trust and risk of the customers on e-commerce. Also, the factors that the e-commerce companies should focus on to earn customer satisfaction are also determined in this study.

METHODS AND MATERIALS

A primary dataset is collected and analyzed with a view to obtaining current information about perception of e-commerce with respect to business to consumer (B2C) e-commerce websites. The data is collected from people of different age groups from Dhaka city. The respondents may have good experience of using internet or not. They also may or may not have former experience with e-commerce websites and businesses. The data collection is done following convenience sampling, where a sufficient questionnaire is made on this purpose. The sample, which is used for this study, is 450 people from Dhaka city, Bangladesh. Binary logistic regression analysis, a very popular statistical analysis approach, is used to analyze the trustworthiness and risk perception of the customers. If the response vector **Y** be of binary type, i.e., meaning to whether an event of interest has occurred or not, binary logistic regression is used, which takes the following functional form [16].

$$\pi(\mathbf{x}) = \frac{e^{\mathbf{x}'\boldsymbol{\beta}}}{1 + e^{\mathbf{x}'\boldsymbol{\beta}}}$$

Where $\pi(\mathbf{x})$ represents the conditional mean of **Y** given **x** i.e., $E(\mathbf{Y}|\mathbf{x})$. The unknown parameter $\boldsymbol{\beta}$ is estimated by the method of maximum likelihood estimation [17, 18].

Kano model is used in this study to find out customer's needs that require to give highest priority to improve performance of e-commerce by increasing customer's satisfaction [19, 20]. This model divides the needs of the customers into basic needs, expected needs and excitement needs and then specifies the rank of each needs within the groups [21].
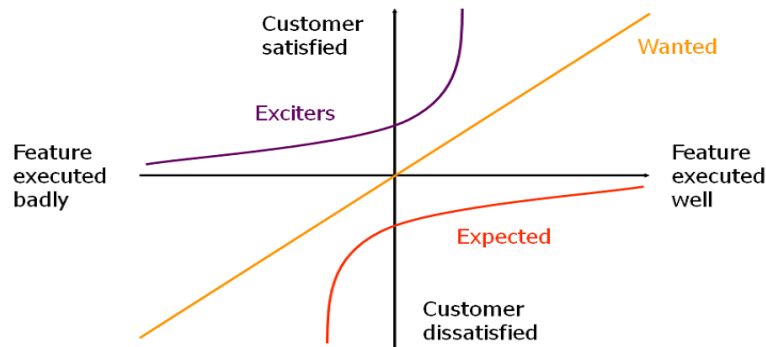

Fig-1: The Kano Model Analysis

Oftentimes, data collection on the attitudes, personalities, opinions, emotions, and descriptions involves the use of Likert scales [22, 23]. As individuals attempt to quantify constructs that cannot be measured directly promotes using multiple-item scales and summated ratings to quantify the construct(s) of interest [24, 25]. We have devised thirty-four items to measure trust, risk perception, market orientation, technology trustworthiness and web experience. Each question used in this study was in a 5-point Likert item from "strongly disagree" to "strongly agree" categories. Cronbach's alpha is considered to be a measure of scale reliability [26]. It is generally used when there are multiple Likert questions which form a scale and the researcher wants to determine whether the scale is reliable or not [27]. Cronbach's alpha is calculated as the squared correlation of the sample values which is obtained using a multi-item scale and their true values [28]. Mathematically:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_{Y_i}^2}{\sigma_X^2}\right),$$

Where k is the number of items, σ_X^2 is the variance of the sum of all of the items, and $\sigma_{Y_i}^2$ is the

variance of the ith item [22]. As it is a ratio of two variances, its theoretical value varies from zero to one. Higher values of alpha are more desirable and most of the researchers, as a rule of thumb, require a reliability of 0.70 or higher before they use an instrument [29].

RESULTS AND DISCUSSIONS

The Reliability Statistics at Table-1 provides the actual value for Cronbach's alpha. It is seen that Cronbach's alpha is 0.776, which indicates a high level of internal consistency for our scale with the data.

Table-1: Reliability statistics

Reliability statistics	
Cronbach's Alpha	Number of Items
0.776	34

The final column of Table-2 shows the values of Cronbach's alpha if the corresponding items are deleted. We can see from the values at last column that removal of any item would result in a lower Cronbach's alpha (lower than 0.776). Therefore, we would not remove these questions.

Table-2: Item-Total Statistics

Item-Total Statistics (if corresponding item is deleted)	Scale Mean	Scale Variance	Correlation*	Cronbach's α
Necessary skills and ability to carry out online transaction	111.19	116.719	0.374	0.766
Necessary technology knowledge to carry out online transaction	111.25	117.232	0.319	0.768
Technology obstacles should not be a major concern	111.69	117.426	0.255	0.772
Technical failure	111.56	117.050	0.316	0.768
Technical failure	111.56	117.050	0.316	0.768
Predict performance by the customers	110.94	119.382	0.263	0.771
Past and future behaviors are positively related	110.79	118.341	0.295	0.770
When the new one is dealing, I had a pleasant experienced	110.99	119.134	0.279	0.770
Care, concern, goodwill to their customers	111.08	114.664	0.441	0.762
Performing the outmost of the customers benefit	111.23	117.229	0.322	0.768
Demonstrate customers believe	111.54	116.594	0.334	0.768
Risky when fail to meet customer expectations	110.81	123.393	0.044	0.770
Risky when the products inferior quality	110.80	120.771	0.181	0.774
Risky when the products may be dangerous	111.42	120.617	0.151	0.776
Risky when the products may be available lower price	111.01	121.330	0.133	0.767
Risky when it may cause others to think poorly	111.66	119.364	0.209	0.774
Risky when the products delivered may fail my personal image	111.31	119.452	0.233	0.772
Risky when the products delivered may fail the expected time	111.11	120.112	0.194	0.774
The web sites are good at collecting customers information	111.07	119.181	0.273	0.771
Web sites encourage customers to send their feedback	110.86	118.748	0.296	0.770
Feeling embarrassed to send negative feedback	111.04	119.176	0.243	0.772
Web sites review and customers opinions effectively	111.13	118.538	0.281	0.770
Customers opinion can reach the relevant department	111.23	117.655	0.315	0.769
Customers opinion can easily be lost	111.19	120.675	0.174	0.775
Customers opinion can influence the way of website	110.76	119.431	0.283	0.770
Receiving a timely response	111.10	119.241	0.268	0.771
Purchasing is solved effectively and satisfactorily	111.26	117.631	0.318	0.768
Web sites value customers opinion	111.09	119.116	0.280	0.770
Allowing customers contribution to the sites	111.19	117.595	0.344	0.767
Transactions and deliveries work out quite smoothly by the joint effort	111.01	119.092	0.321	0.769
Finding out mistake during transaction	111.10	117.818	0.323	0.768
Conflicting information on the different pages	110.89	120.456	0.201	0.774
Capable of processing a large number of transactions	111.24	114.915	0.425	0.763
Technologies are effective keeping the accurate data	111.12	117.914	0.329	0.768
Getting access to the data without permission	110.53	121.635	0.121	0.775

*Corrected Item-Total Correlation

Table-3 represents the binary logistic regression model results that investigates the factors behind the trustworthiness of the customers on e-commerce. The result finds the variables age, experienced of using internet, internet using purpose, and market orientation as significant, while education status, payment system, and technology are insignificant at 5% level of significance. Age has a significant association (p-value 0.044) with trust in online business. The odds of having trust is increased by (1.584 - 1)*100% or 58.4% for one unit increase in age, keeping all other covariates at fixed level. The

respondents who are experienced of using internet have significantly 51.5% less odds of having trust in online business compared to those who are inexperienced having p-value 0.005. For the variable internet using purpose, the respondents using internet for educational purpose, online banking, and online game have significantly 2.469, 2.775, and 1.918 times odds, respectively, of having trust on e-commerce compared to those who belong to others category with respective p-value 0.098, 0.035, and 0.095. Market orientation significantly increases the odds of having trust on e-commerce by 5.705 times with p-value less than 0.001.

Table-3: Binary logistic regression model estimates of the selected covariates for having trust on e-commerce along with standard error (SE), odds ratio (OR), and p-value

Covariates	Coefficient	SE	OR	p-value
Constant	-5.366	1.728	0.004	0.001
Age	0.460	0.249	1.584	0.044
Education status				
Secondary	0.669	1.416	1.952	0.636
Higher secondary	1.037	1.419	2.820	0.465
Graduate	0.683	1.506	1.980	0.650
Higher	0.503	2.278	1.654	0.825
Primary	-	-	-	-
Experienced of using internet				
Agree	-0.722	0.446	0.485	0.005
Disagree	-	-	-	-
Internet using purpose				
Entertainment	-0.023	0.501	0.976	0.961
Educational purpose	0.903	0.547	2.469	0.098
Shopping	-0.245	0.358	0.782	0.494
Information search	-0.388	0.541	0.678	0.473
Social networking	-0.203	0.451	0.815	0.652
Online banking	1.020	0.486	2.775	0.035
Online game	0.651	0.390	1.918	0.095
Others	-	-	-	-
Payment system				
Visa	0.049	0.504	1.050	0.922
Amex	-1.375	0.943	0.252	0.145
Paypal	-0.298	1.505	0.742	0.843
Amazon payments	-1.573	1.186	0.207	0.184
Master card	-0.062	0.551	0.938	0.909
bkash	1.047	0.405	2.851	0.119
Rocket DBBL	-0.064	0.559	0.937	0.907
Cash on delivery	-	-	-	-
Market orientation				
Agree	1.741	0.363	5.705	<0.001
Disagree	-	-	-	-
Technology				
Agree	1.244	0.388	3.470	0.211
Disagree	-	-	-	-

Risk perception of the customers on e-commerce is analyzed through binary logistic regression and the result is presented at Table-4. According to the table, the variables experienced of using internet, internet using purpose, and market orientation are significant factors of risk perception, while age, education status, payment system, and

technology are found insignificant at 5% significance level. The variable experienced of using internet is significant at 5% level of significance (p-value .017). An individual who is experienced of using internet has (1-0.407)*100% or 59.3% lower odds of having risk perception on e-commerce compared to an individual who is not experienced of using internet, keeping all

other variables at a fixed level. For the variable internet using purpose, the individuals who use internet for entertainment and the respondents who use internet for social networking have significantly (1-0.439)*100% or 56.1% lower odds and 3.343 times odds of having risk perception, respectively, compared to the individuals who belongs to the others category having respective p-value 0.077 and 0.003. Market orientation significantly increases the odds of having risk perception on e-commerce by 2.112 times with p-value 0.019.

Table-4: Binary logistic regression model estimates of the selected covariates for risk perception on e-commerce along with standard error (SE), odds ratio (OR), and p-value

Covariates	Coefficient	SE	OR	p-value
Constant	-16.527	1313.917	<0.001	0.989
Age	0.114	0.211	1.121	0.587
Education status				
Secondary	15.678	1313.917	>50.000	0.990
Higher secondary	15.565	1313.917	>50.000	0.990
Graduate	15.038	1313.917	>50.000	0.990
Higher	-0.726	1891.722	0.483	0.999
Primary	-	-	-	-
Experienced of using internet				
Agree	-0.896	0.377	0.407	0.017
Disagree	-	-	-	-
Internet using purpose				
Entertainment	-0.821	0.466	0.439	0.077
Educational purpose	0.135	0.461	1.145	0.769
Shopping	-0.229	0.312	0.795	0.463
Information search	0.199	0.473	1.220	0.673
Social networking	1.207	0.409	3.343	0.003
Online banking	0.160	0.425	1.173	0.706
Online game	-0.188	0.339	0.828	0.578
Others	-	-	-	-
Payment system				
Visa	-1.989	0.636	0.136	0.121
Amex	1.342	0.801	3.829	0.193
Paypal	0.727	1.359	2.069	0.592
Amazon payments	0.091	1.011	1.095	0.927
Master card	-0.719	0.609	0.486	0.237
bkash	-4.225	-458.591	1.717	0.121
Rocket DBBL	0.495	0.508	1.641	0.329
Cash on delivery	-	-	-	-
Market orientation				
Agree	0.747	0.321	2.112	0.019
Disagree	-	-	-	-
Technology				
Agree	-0.222	0.334	0.801	0.506
Disagree	-	-	-	-

On the construction of Kano questionnaire, for each product feature, a pair of questions is formulated to which the customer can answer in one of five different ways [30]. The first question is about the reaction of the customer if the product ensures certain features (functional form of the question) and the second question is about the reaction if the product does not met the features (dysfunctional form of the question) [31].

Table-5: Functional and dysfunctional question in questionnaire

Functional form of the question	How much you agree with the statement "Most commercial websites have the necessary skills and ability to carry out online transaction."	Strongly agree Agree Neutral Disagree Strongly disagree
Dysfunctional form of the question	How much you agree with the statement "Most commercial websites do not have the necessary skills and ability to carry out online transaction"	Strongly agree Agree Neutral Disagree Strongly disagree

By combining the two answers the product features can be classified as given in Table 6. From the Kano matrix at Table 6, category A indicates attractive customer requirement from the customer's viewpoint. If the attractive requirements exist, it's better for the companies but if they don't exist, it doesn't imply that the customers become dissatisfied. Category O highlights the one-dimensional requirements, which means that their presence satisfies the customers, moreover, the more intense, the higher the satisfaction. Category I means that customers are indifferent to what feature the product has. So, these features don't affect the degree of client satisfaction. Questionable result is expressed by category Q. Usually, the answers hardly fall into this category. Questionable scores imply that the question was phrased wrongly or the respondent misunderstood the question or a wrong answer is crossed out by mistake. Category R implies this product feature is not wanted by the customer but he may expect the reverse. Category M stands for must be given requirements. The clients will surely be dissatisfied without them.

Table-6: KANO matrix

Customers requirement		Dysfunctional Question's rating (Negative Question)				
		Like	Must be	Neutral	Live with	Dislike
Functional Questions Rating (Positive Question)	Like	Q	A	A	A	O
	Must be	R	I	I	I	M
	Neutral	R	I	I	I	M
	Live with	R	I	I	I	M
	Dislike	R	R	R	R	Q

Table-7: Hierarchical table of customer's need

Customer needs	**Trust**	Competence
		Predictability
		Good will
	Risk Perception	Perception Risk
		Financial Risk
		Social Risk
		Psychological Risk
		Time Risk
	Market Orientation	Information Generation
		Information Dissemination
		Responsiveness
		Coordination Mechanism
	Technology Trustworthiness	Reliability
		Security

Table-8 analyzes customers' needs and compares the priorities which might be fulfilled to satisfy customers. In the group of one dimensional needs (O), social risk gained 35.8% frequency under risk perception. It confirms that in order to keep customers happy, e-commerce must give first priority to social risk. In the group of must be given needs (M), responsiveness gained 67.1% frequency which is higher than any other needs in this group. So, it is necessary to improve responsiveness towards customer in order to keep them satisfied. Security, under technology trustworthiness, carries 32.2% frequency in the attractive needs group (A). It will lead to customers' satisfaction high but it may not be the reason for their disappointment because it is in attractive need group. Finally, in the group of indifferent needs (I), customers are indifferent about competence (44%). The reverse (R) and questionable (Q) categories are found inactive on the dataset as the frequencies obtained in the categories are very low.

Table-8: Identification of product and prioritizing requirements

	Customers Need	O	M	A	I	R	Q	Cat
Trust	Competence	0.091 9.1%	0.407 40.7%	0.058 5.8%	0.44 44.0%	0.0 0%	0.004 0.4%	I
	Predictability	0.016 1.6%	0.607 60.7%	0.153 15.3%	0.224 22.4%	0.0 0%	0.0 0%	M
	Good will	0.082 8.2%	0.433 43.3%	0.084 8.4%	0.396 39.6%	0.0 0%	0.004 0.4%	M
Risk Perception	Perception Risk	0.06 6%	0.558 55.8%	0.144 14.4%	0.238 32.8%	0.0 0%	0.0 0%	M
	Financial Risk	0.147 14.7%	0.46 46.0%	0118 11.8%	0.242 24.2%	0.0 0%	0.033 3.3%	M
	Social Risk	0.358 35.8%	0.289 28.9%	0.033 3.3%	0.238 23.8%	0.0 0%	0.082 8.2%	O
	Psychological Risk	0.233 23.3%	0.358 35.8%	0.058 5.8%	0.322 32.2%	0.0 0%	0.029 2.9%	M
	Time Risk	0.204 20.4%	0.473 47.3%	0.082 8.2%	0.218 21.8%	0.0 0%	0.022 2.2%	M
Market Orientation	Information Generation	0.009 09%	0.624 62.4%	0.096 9.6%	0.271 27.1%	0.0 0%	0.0 0%	M
	Information Dissemination	0.02 2.0%	0.518 51.8%	0.062 6.2%	0.40 40.0%	0.0 0%	0.0 0%	M
	Responsiveness	0.007 0.7%	0.671 67.1%	0.08 8.0%	0.242 24.2%	0.0 0%	0.0 0%	M
	Coordination Mechanism	0.007 0.7%	0.607 60.7%	0.109 10.9%	0.278 27.8%	0.0 0%	0.0 0%	M
Technology Trustworthiness	Reliability	0.091 9.1%	0.418 41.8%	0.084 8.4%	0.402 40.2%	0.0 0%	0.004 0.4%	M
	Security	0.056 5.6%	0.422 42.2%	0.322 32.2%	0.176 17.6%	0.0 0%	0.024 2.4%	M

The customer satisfaction coefficient (CS-coefficient) presented at Table-9 is an indication to the degree to which customer satisfaction rises if a product requirement is fulfilled or the degree to which customer satisfaction falls if a product requirement is not fulfilled. It is important to know the average impact of a product or service requirement on the overall satisfaction of all customers. The positive CS coefficient varies from 0 to 1. Values closer to 1 means high effect on customer satisfaction. A positive CS-coefficient closer to 0 implies that it has a very little effect. Moreover, the negative CS-coefficient must also be taken into consideration. Values closer to -1 means the effect on client dissatisfaction is high if the product feature is not met. A value closer to 0 signifies that this feature causes no dissatisfaction if it is not fulfilled.

Table-9: Computation result of CS-coefficient for customer's need

			Extent of satisfaction and dissatisfaction CS-coefficient	
	Customers Need	Category	Satisfaction (A+O)/(A+O+M+I)	Dissatisfaction (O+M)/(-1*(A+O+M+I))
Trust	Competence	I	0.150	-0.496
	Predictability	M	0.170	-0.620
	Good will	M	0.162	-0.517
Risk Perception	Perception Risk	M	0.202	-0.617
	Financial Risk	M	0.274	-0.627
	Social Risk	O	0.425	-0.699
	Psychological Risk	M	0.302	-0.605
	Time Risk	M	0.290	-0.690
Market Orientation	Information Generation	M	0.105	-0.631
	Information Dissemination	M	0.082	-0.538
	Responsiveness	M	0.087	-0.678
	Coordination Mechanism	M	0.115	-0.613
Technology Trustworthiness	Reliability	M	0.175	-0.511
	Security	M	0.384	-0.485

It is found from Table-9 that the CS-coefficient for satisfaction is highest for social risk (0.425) which suggests the e-commerce companies to focus on the social risk of the customers to make them satisfied. The security issue for technology trustworthiness is also very important to earn customer satisfaction as it gets second highest CS-coefficient score (0.384). Psychological risk (CS-coefficient 0.302) of the customers plays another vital role in the satisfaction issue. Rest of the factors are not so concerning as they have too low scores to consider. On the other hand, the CS-coefficient for dissatisfaction is high for predictability, perception risk, financial risk, social risk, psychological risk, time risk, information generation, responsiveness, and coordination mechanism. Without confirmation of these factors, the customers will often be dissatisfied.

CONCLUSION & IMPLICATIONS

This study is about drawing conclusion on major factors related to trust and risk perception of customers towards B2C e-commerce companies by using various statistical analysis approaches. The obtained results will help to improve e-commerce performance by deciding which criteria should be given more priority within time and money constraint. This study involves binary logistic regression model to investigate the potential factors of trustworthiness and risk perception of the customers on e-commerce. The study finds that the trust on e-commerce significantly increases with the increase in age. A research is found in the literature that also shows that trust on e-commerce is influenced by age factor [32]. Internet using experience has negative relationship with having trust and having risk perception on e-commerce. A previous work finds significant association between internet using experience and trust on e-commerce [33]. The more experienced a person is in using internet, the less trust he/she has on e-commerce. Again, the experienced internet users have less risk perception on e-commerce. That is, the experienced internet users show less trust on online business, as well as they are not much worried about the risks from e-commerce. The respondents who usually use internet for educational purpose, online banking, and online game have comparatively higher chance to keep faith on e-commerce. Different internet using purposes also have significant relationship with risk perception. The respondents using internet for entertainment feel lower risk, while the respondents using internet only for social networking feel higher risk on e-commerce.

Market orientation also plays important role to increase both trust and risk perception on e-commerce. However, building trust in e-commerce may not be succeed by any individual website [1]. Rather, it can be gained at group level. Consumers first have to decide whether to purchase from online or not before deciding to purchase from which website. So, they will have to evaluate the trustworthiness towards e-commerce as a whole, before going to evaluate the possibility of any individual website. According to the Kano model findings, social risk should be given the first priority to satisfy the customers. To improve responsiveness towards customers is very important since it is found as the must be given needs. The result shows that the feature 'security confirmation', under technology trustworthiness, attracts the clients. The model finds that the respondents are indifferent about competence of the e-commerce companies. It is evident from the CS-coefficients that safety confirmation on social risk, security, and psychological risk increases the satisfaction of the customers. Meanwhile, the customers are dissatisfied if they feel lacking in the factors like predictability, perception risk, financial risk, social risk, psychological risk, time risk, information generation, responsiveness, and coordination mechanism.

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