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ARTICLES

Review

Research

Review

The impact of tax policy stimulus on automobile choice- Evidence from Chinese automobile industry

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Using detailed national brand-level automobile sales data from January 2004 to the end of 2009, we quantify the impact of a series of tax policy stimuli initiated by the Chinese Government on automobile sales in China. These tax stimuli aimed either to prevent high displacement car consumption or to encourage low displacement car purchases. We conclude that the first two tax adjustments surpass high-emission auto sales, and the third adjustment promotes the overall auto sales.

Key words: Tax policy; automobile industry; country of origin; automobile emission.

INTRODUCTION

The total sales of China automobile market in 2009 was 13.64 million with 46.15 percent year-on-year growth, surpassing the United States for the first time and becoming the world's largest auto market. In 2010, automobile production reached 182.65 million with 32.44 percent year-on-year growth and automobile sales reached 180.62 million with 32.37 percent growth, winning the world's first.

With the increasing auto production and inventory in China each year, the huge consumption of oil resulting from the popularity of automobile is increasingly prominent. Harmful gases are discharged into the air, causing air pollution and greenhouse effect. Thus developing low-carbon economy has become an urgent problem that every country has to face. Under the background of conservation-minded and eco-friendly society, it is very necessary to develop energy-efficient, low - emission and material consumption automobile

industry, and improve automobile products' structure and market purchasing orientation through special policies and methods.

Against this background, the government adjusted excise tax twice on April 1st, 2006 and September 1st, 2008 respectively, and one purchase tax adjustment on January 2009. The first two excise tax adjustments aim to "suppress big" and "encourage small" which means curbing the consumption of high-emission cars and promoting the consumption of low ones. And the third purchase tax adjustment only intends to "encourage small", which means to promote consumption of low-emission cars through cutting the purchase tax. After three times of tax adjustment, relevant departments, foreign media and consumers comment differently on whether the purpose of "damps raises greatly is small" can be achieved or not. Some experts believe that the tax adjustment only can protect environment in short term,

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but not really change the automobile consumption structure, while others believe that the tax adjustment deeply influences consumers' purchase intention.

Previous comments are all subjective, lacking scientific evidence and reliable empirical data. In addition, there are no academic research that can answer the effects of China automobile tax adjustment through empirical research methods. To fill the research gaps, this paper intends to raise the following questions: (1) Do two excise tax adjustments affect China automobile sales? (2) Do purchase tax adjustments affect our automobile market? (3) If they both do, when does the maximum effect happen? What moderator variables contribute to it? Specially, we also examine the regulation of automobile emission and country of origin, and answer whether high-emission cars are inhibited and low-emission ones are promoted, and show that indigenous cars or joint ventures cars are more inhibited.

This paper is the first to empirically investigate the effectiveness of tax adjustment in China. It also has some innovations: firstly, how external macroeconomic policy and enterprise micro strategy affect consumer purchase behavior is explored; secondly, in order to know the effect of changes in policy or strategy, scale effect and structural effect are separated; thirdly, it shows up the particularity of China automobile market, as well as the peculiarity of the two taxes; the forth, the policy effectiveness assessment is comparatively deficient at the dependent variable of marketing performance. The fifth, we stand on the sight of the consumer behavior but not the qualitative and theoretical researches.

LITERATURE REVIEW

Abroad

Previous studies abroad on policy adjustment have set the foundation for policy impact on auto. Earlier researches study the effect of different fuel tax level on consumer welfare, applying questionnaire data of U.S. consumer census (Fullerton and West, 1999).

In Japan, Fullerton et al. (2004) take automobile consumption of Japanese residents and simulate the impact of policy changes on the family automobile consumption and the mileage. The policy simulation includes changing the cost per kilometer, such as tax based on emission, carbon tax, fuel tax, etc., and changing vehicle cost, such as tax based on engine size, displacement and years of use.

In Mumbai, there are three policies towards decreasing pollution: upgrading the diesel engine to the greener CNG, rising fuel price and collecting auto license tax. Takeuchi et al. (2007) adapt first-hand questionnaire survey and assesse that which has stronger inhibitory effect on vehicle emissions among the above three policies by selection model and nested selection model.

This study finally confirms that the most effective method is upgrading diesel engine by evaluating price elasticity and income elasticity, and it would not lead to bus fare rising but consumers converted to family cars, then proceed to exhaust emission.

In United States, provided that gasoline price rose one cent, gasoline consumption would lead to a decrease of 0.2%, through investigating the impact of increasing gasoline tax on U.S. auto market (Bento et al., 2009).

Gallego et al. (2011) study the impact of auto control policy on air pollution (carbon dioxide purity) in two Latin American urban Mexico and Santiago. They regard time as regulated variable and distributed it into three periods: peak, off-peak and weekend, proceeding to investigate the difference of policy responses in different period. Furthermore, they study policy impact on new car sales and used-cars trading volume through Diff-in-Diff methodology.

Domestic

With the development of auto industry and the worse situation of air pollution, policy adjustment in China is becoming a hot issue that many scholars analyze it in different angles and synthesize the literature on auto tax. Wang (2007) analyzes the impact of excise tax reform of China in 2006. Guo (2010) explores the impact of auto purchase tax initiated and implement on several state-owned firms in two time point respectively applying correlation analysis. It shows that most auto companies' stock soared in varying degrees. Particularly, Audi as a typical high-emission model, its sales is refrained by two auto purchase tax adjustment through descriptive analysis and correlation analysis (Zhu, 2010). Xiao and Ju (2011) study the impact of two auto excise tax released on April1, 2006 and September 1, 2008 on pro-environment (fuel consumption, etc) and social welfare. It finds that the policy decreased the total auto sales, thereby enabling to reduce fuel consumption, but the consumption structure of the various models is not affected. Afterwards, they also study the impact of the fuel tax reform policy announced in 2009, and find the same results. The only difference is that consumers' welfare loss is greater than the consumption tax loss due to fuel tax increasing. Chen et al. (2010) concern about the consumption tax reform in 2006, and find that the price effect and advertisement effect result from the time lag between releasing policy and implementing it.

Systemizing the previous literature, the tax lever applied in adjusting foreign auto industry consumption structure is generally fuel tax, license tax, carbon tax, etc., rarely on excise tax and purchase tax, which is China's unique characteristics. Part of existing domestic study has focused on China auto industry tax policy which lays a good foundation for our study. Overall, the results are limited and most qualitative research based

Table 1. Adjustment of Consumption Tax Rates in China on April 1st, 2006.

Displacement	Before	After	Adjustment range
(Liter)	(a)	(b)	(b)- (a)
<=1	3%	3%	0
(1,1.5]	5%	3%	-2%
(1.5,2]	5%	5%	0
(2,2.5]	8%	9%	1%
(2.5,3]	8%	12%	4%
(3, 4]	8%	15%	7%
>4	8%	20%	12%

on descriptive analysis and correlation analysis, etc. Articles that apply selection model and other scientific and systematic methodology are deficient.

Nation equity and brand equity

Nation equity is a concept of the equity or goodwill associated with a country. It refers to the generalized COO effects, including performance-based COO effects and normative COO effects (Maheswaran and Chen, 2008). Nation equity can impact the company or product performance-related perceptions, and can be positive or negative as a function of culture, politics, religion, economic development and other external macro factors (Maheswaran and Chen, 2008). However, researches referring to consumers' cognition and preference on COO and brands in auto industry have smaller numbers. Li (2008) studies how do the nation image influences consumer product purchase intention such as auto using questionnaire data. Tian (2010) concerns many local auto companies and explores how do they win competitive advantages and break through as the powerless latter, meanwhile, providing projects for building strength brand. He and Zhou (2011) analyze the influences on consumer cognition and behavior which are accrued from Japan nation image, auto function attributes and brands marketing experience. Additionally, they come up with some countermeasures and suggestions based on brand marketing experience of Japan auto; that is how China auto industry creates a strong brand and eliminates the negative impression of "Made in China". Regarding consumers in Taiwan as object for research, Huang et al. (2008) study how brand equity cognition differs from consumers in different demographic variables.

Although limited literature devoted to nation equity and brand equity studies of auto industry, referring to nation equity and nation image in general (Wang and Deng, 2010; Wang et al., 2009), country of origin (COO) effects (Wang and Yang, 2004), brand equity and brand image

(Fang et al. 2011), domestic researches have rich achievements and high academic value, laying a good foundation for our study on the heterogeneity of consumers' reaction of different COO and different brands auto tax adjustments.

Three automobile industry tax policy adjustments

To conserve energy, reduce emission, increase the awareness of environmental protection, encourage purchasing low-fuel and low-emission cars and optimize automobile production consumption structures, China government adjusted tax policy several times on local automobile market. Recalling the large-scale tax adjustment history of Chinese auto industry, there are three times adjustments.

The first adjustment

On March 21th, 2006, China Ministry of Finance and the State Administration of Taxation issued adjustment towards the items, rates and related policy of current excise tax. The adjustment was implanted in April 1st 2006. It significantly improved the ratio of cars which displacements are above 2.5 liter. That is a great shock on high-emission cars, and tax-inclusive prices of some imported luxury cars in Shanghai increased by 150,000 overnight. However, the ratio of low-emission cars with under 1.5 liter displacements was decreased, which released the intense signal of "damps raises greatly is small". The detail tax rate adjustment of the first policy is shown in Table 1.

The second adjustment

After two years of market reaction, further adjustment towards auto excise tax was carried out in September 1st 2008 by China Ministry of Finance and the State Administration of Taxation. This tax adjustment continued to raise the excise tax of high-emission and luxury cars, and lower the tax of low-emission ones. After the adjustment, manufacturers reacted differently and consumers also make sensitive responses. The detail tax rate adjustment of the second policy is shown in Table 2.

These two-timesadjustments mainly focused on excise tax, aiming to manufacturers. The excise tax equals to manufacturers' price multiplied by the excise tax rate. Manufacturers passed on the tax to the ultimate consumer on their own, all controlled by the manufacturers themselves.

The third adjustment

Differed from the two previous excise tax adjustments,

Table 2. Adjustment of consumption tax rates in China on September 1^{st,} 2008.

Displacement	Before	After	Adjustment range
(Liter)	(a)	(b)	(b)- (a)
<=1	3%	1%	-2%
(1,1.5]	3%	3%	0
(1.5,2]	5%	5%	0
(2,2.5]	9%	9%	0
(2.5,3]	12%	12%	0
(3, 4]	15%	25%	10%
>4	20%	40%	20%

Table 3. Adjustment of consumption tax rates in China on January 20^{th,} 2010.

Displacement	Before	After	Adjustment range
(Liter)	(a)	(b)	(b)- (a)
<=1.6	10%	5%	-5%
>1.6	10%	10%	0

the third targets are car consumers. The car purchase tax is paid to the Internal Revenue Service. The general cost is the total auto price divided by 117% of the value-added tax, then multiplied by purchase tax rate.

The purchase tax adjustment initiated on January 20^{th,} 2009 reduced 5% purchase tax of cars with 1.6 liters and less displacement while the ratio of cars with over 1.6 liter displacement remained the same as before. The specific rate programs of the third adjustment are shown in Table 3.

Within four years, China has three major adjustments of the tax ratio for the auto industry, respectively; twice excise tax adjustments against manufactures and once purchase tax adjustment against consumers. Well, whether do they have effect? How effective? Do they really help "damps raises greatly is small"? What fluctuation towards tax ratio adjustment do sales of different displacement, different brands and different models have?

EMPIRICAL STUDY

Empirical method

We use empirical methods and quantitative analysis to build the marketing econometric model, regarding three tax adjustments as dummy variables, exploring the impact of the different policies' stimulation on auto sales.

Data

In this study, research data are monthly sales data of China auto

industry from January 2004 to December 2009 covering 72 months and three tax policy adjustment periods. The sales data include 15290 observations of 675 brands from 59 auto manufactures in China. Variables in data include attributes such as sales, prices, displacement and dummy variables includes joint car and local brands. In addition, the study also uses other auxiliary data such as GDP and monthly retail price, which can exclude the impact of economic fluctuation and other external policy factors through controlling variables.

Model setup

Logical model

Suppose that customer i can choose a car from j brands, and we define it as vector X_{jt}. X_{jt} includes a series of attributes and environmental factors such as three auto tax policy. P_{jt} is retail brand price. Consumers can also choose not to buy or buy zero brands; we named it outside good. The utility that consumer i derives from purchasing product j in quarter t is given by:

$$U_{ijt}=\beta_{0i}+\beta X_{it}-\alpha P_{it}+\varepsilon_{ijt} \quad j=1,...,J$$

(1)

β_{0i} is customer i's intrinsic preference for brand j, β is response coefficient of consumers towards observed product attributes and environment variable. α is response coefficient on price. ε_{ijt} is customer i's idiosyncratic preference for brand j in quarter t, which gives rise to the following consumer i's logical choice probability for brand j in quarter t:

$$P_{ijt}=\frac{\exp(\alpha_{ij}+\beta X_{jt}-\alpha P_{it}+\varepsilon_{ijt})}{1+\sum_{j=1}^{1}\exp(\alpha_{ij}+\beta X_{jt}-\alpha P_{it}+\varepsilon_{ijt})}$$

(2)

Control function

After getting the probability for brand j, market share of brand j in quarter t is S_{jt}, which is the ratio of sales to the total auto market sales.

$$S_{jt}=\frac{\exp(\alpha_{ij}+\beta X_{jt}-\alpha P_{it}+\varepsilon_{jt})}{1+\sum_{j=1}^{1}\exp(\alpha_{ij}+\beta X_{jt}-\alpha P_{it}+\varepsilon_{jt})}$$

(3)

The probability of outside good is:

$$S_{0t}=\frac{1}{1+\sum_{j=1}^{1}\exp(\alpha_{ij}+\beta X_{jt}-\alpha P_{it}+\varepsilon_{jt})}$$

(4)

Table 4. Analysis results of main effects and interaction effects.

Dependent variable ln(share)-ln(outside)	Model (1) main effect	Model (2) displacement is interaction	Model (3) COO is interaction
Stm1	-.23***	-.448***	-.445***
Stm2	-.18***	-.499***	-.854***
Stm3	.39***	.584**	.058**
Logarithmic price	-1.60***	-.907***	-.895***
manual or automatic	-.146	-.098	-.141
Two-box or three-box	-.654	-.721	-.713
Displacement		-.111	
Stm1*Displacement		-.122**	
Stm2*Displacement		-.060	
Stm3*Displacement		-.260*	
Country of origin			1.281
Stm1*COO			-.010
Stm1*COO			.690***
Stm1*COO			.439**

*The columns of the table list the results of different regression models which are all applying auto brand fixed effects. The dependent variable is the logarithmic of a car market share minus the logarithmic of external product market share. Stm1, Stm2 and Stm3 are excise tax policy promulgated in April 2006, adjustment policy promulgated in September 2006 and purchase tax adjustment policy promulgated in January 2009 respectively. If they implemented, the value is 1, 0 otherwise. *p<.1, **p<.05, ***p<.01

For the convenience of the parameter estimates, we convert (4) divided by (3) to linear form as follows:

$$Ln(S_{jt}/S_{0t}) = Ln(S_{jt}) - Ln(S_{0t}) = \alpha_j + \beta X_{jt} - \alpha P_{jt} + \varepsilon_{jt} \quad (5)$$

Taking derivatives of right of Equation (5), we obtain multiple variables for research as:

$$Ln(S_{jt}) - Ln(S_{0t}) = \beta_0 + \beta_1 \times STM_1 + \beta_2 \times STM_2 + \beta_3 \times STM_3$$
$$+ \beta_4 \times P_{jt} + \beta_5 \times INTERACT_{jt} + \beta \times COVARIATES_{jt} + \varepsilon_{jt} \quad (6)$$

Argument

Equation (6) is a terminal model. Vector X is one of arguments in right equation, and its first part are attributes of auto brand products (represented by COVARIATES), including manual or automatic, two-box auto or three-box auto, displacement and country dummy(1 for foreign, 0 for China). In addition, it also uses other macro environment variables such as GDP level and oil prices. It also includes environment variables, which are three dummy variables of auto tax policy, where, STM1, STM2, and STM3 are excise tax policies released in April 2006, adjustment policy released in September 2006 and purchase tax adjustment policy released in January 2009. If they are implemented, the value is 1, and 0 otherwise. Arguments also use price P_{jt} to control price effects and residual ε_{ijt}.

Interaction

To consider the different impacts of excise tax and purchase tax on different displacement cars and consumers' purchase reaction on different country of origin, we take displacement × policy and COO × policy of the two interaction terms into variables.

MODEL ESTIMATION AND RESULTS ANALYSIS

We use STATA 10 to analyze data. In order to control the brand effect and maintain results reliability, the main effect and interaction in data analysis inspection use fixed effect regression. Table 4 has three regressions in testing. Model (1) is the main effect. Model (2) mainly inspects interaction of displacement. Model (3) studies the interaction of the regulatory impact of COO.

Main effects

At first, we analyze the main effects and control attributes of price, manual, automatic, two or three-box. The results show that the coefficients of policy 1(β = -0.23, P<0.01) and policy 2 (β = -0.18, P<0.01) are significantly negative, indicating that two excise tax implementations surpass auto sales (β = -0.23, P<0.01). Policy 3's coefficient is significantly positive (β = 0.39), showing that cutting purchase tax in 2009 promoted the overall sales. From this analysis we found that all of two excise taxes issued in 2006 and in 2008 one purchase tax issued in 2009 work on automobile market; the first two inhibited auto sales, and the third stimulated auto sales.

Interaction effect

Accounting for interaction effects, the value of Stm1* displacement is negative and significant ($\beta = -0.12$, P<0.05), indicating that the higher auto displacement, the more suppression policy1 taking on auto sales; the interaction between Stm2 and displacement is not significant; the interaction effect between Stm3 and displacement is negative and significant on 0.1 level, showing that the smaller displacement models, the stronger promotion taken by policy 3. In other words, tax incentive policies that halved the purchase tax have deeper effect on low-emission cars. This finding is consistent with the original intention of the relevant policies implementation, indicating the effectiveness of policies; excise tax effectively inhibited the consumption of high-emission and environmental damage cars; halved purchase tax adjust consumer excise structure well and promoted the low-emission cars consumption in large scale. Another interesting regulated variable is country of origin. We know Stm 2 and country of origin have a significant positive interaction terms from the results of the third column. Country dummy variable that is 1 represents the joint venture (foreign); 0 is China's own brand, which shows that, after the implementation of policy 2 which limited the excise tax towards purchasing high-emission cars, the most difficult obstacle is domestic brands but not joint venture brands. The value by multiplying Stm 3 and COO is positive and significant, indicating that the purchase tax indeed promotes the consumption of low-emission cars; however, it mainly promotes joint venture auto manufactures. Local manufactures benefit from waiver policy and increase limited sales. In other words, research on COO tells us that it seems that the adjustment policies are effective to change the structure of auto consumption, guiding consumers to buy low or medium-emission economy cars in order to switch to low-carbon, environment-friendly consumption structure. However, when we analyze the internal consumption structure in detail, we find consumption on local high-emission is declining; after the arrival of purchase tax stimulus, Chinese consumers turn to be favor in low-emission cars; however, subject to a substantial increase in sales of more foreign joint venture auto brands. It shows the effect of COO is based on consumers psychology perspective. Recently, Chinese consumers still prefer foreign brand cars.

Research Conclusion

Based on large-scale panel data of China's automobile market, applying the brand selection model logic, using the "Natural experiment" research method in economics, the author studied the impact of three industry policy

adjustments on China's automobile industry consumption structure. The validation of main effect and the analysis of displacement moderator variable interaction effect prove that, three tax adjustments play a role on "suppress high and encourage low". But the moderate effect of country of origin suggests that, compared with foreign famous brands, the competitiveness of China brands is not enough. In other words, it is an important task and challenge for domestic local brands to develop national brands and enhance brand equity by restraining the effect of country of origin mostly in the future.

Managerial implication

Theoretical significance

Establishing an integrated assessment modeling framework

This research attempts to establish a conceptual framework to measure policy marketing effectiveness systematically and comprehensively through exploring the effects of policy objectives (displacement, market size, structure) and the outside effects of objectives (brand, COO, district, etc). The effects of policy objectives are broke down into the scale effect and the structural effect for in-depth analysis and research the heterogeneity of the outside objectives' reaction under the same policy. The assessment framework and methods can expand the effect of other macroscopic policy or micro strategy.

Enriching related marketing theory

This study focuses on the effect of government policy on customer purchase behavior and will be realized by identifying the scale effect (whether policy increase or decrease total consumption) and conversion effect (consumers' purchase intend transform from high emission vehicles into small ones). Ample tax items and changeful tax rate adjustments will provide multinational situations, and greatly enrich the existing theory around this field with the help of the rich conclusions of this study.

The time interval between publication time and implementation time of the excise tax and purchase tax policy can reveal the strategic behavior that forefront consumption in order to enjoy the benefits before the tax rate changes under the influence of "look ahead" and postpone consumption so as to enjoy the change rate of affordable rules. This will enrich the existing marketing research achievement on consumers' "strategic behavior " and " rational consumer".

This study considers the country of origin, brand and geographical effect which are the so called heterogeneity

of different levels response policy. It contributes to comprehending the automotive products' nation equity, brand equity, and enrich existing researches.

Enriching tax price leverage theory

By employing the price leverage, tax has diverse moderating effects. This study quantifies the moderating effects, differences and conditions of excise tax and purchase tax in China's auto industry. These findings will enrich and optimize correlation theory in the tax field.

Practical significance

Significance for relevant policy departments

Policy effectiveness evaluation

It is of great significance for relevant departments using scientific methods to roundly assess policy effectiveness that which is better between grasping excise tax as indirect price lever and purchase tax as direct price leverage. This study can also provide important guiding on how to make policy adjustment more rationally and scientifically, such as tax items level (displacement) design, the direction and amplitude of the adjustment in each level, the time interval design of policy issued.

Significance for auto manufacturers and dealers

This study has a practical significance for all sectors in the auto industry. It is clear that policies will directly guide auto manufacturers' production layout and structure configuration decision, and affect dealers' sales layout. Based on our study, all sectors in auto industry can make more effective response strategies and optimal decision. Variables such as COO, brand, region, etc. can help auto firms to grasp their own advantages and disadvantages, so as to improve nation equity and brand equity.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Environment designing considering the needs of youth according to Abraham Maslow's needs case study: District 9 of Isfahan City

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This study aims to design an environment for the youth by considering their needs and interests. This study sought to provide all of the needs of the youth by environmental affordances according to the hierarchy of needs developed by Abraham Maslow. It was conducted in district 9 of Isfahan city on about 380 of young people and evaluated 8 suggested spaces with 6 groups environmental affordance by use of questionnaire. The findings indicated all the needs of the youth were met based on Abraham Maslow's needs. It was also found that belonging needs were prioritized, accordingly amphitheater was introduced to be the most favorable place as this environment is able to provide the affordances of being with friends and meeting new friends.

Key - words: Youth, environmental affordance, Abraham Maslow, basic needs, cognitive needs.

INTRODUCTION

This work aims to design appropriate areas for youths so that their needs and interests could be met as an influential factor in developing their personality. Fulfilling the interests and needs of the young people may make them healthy, dynamic and useful for their community. Thus, designing proper environment in which young people could have useful activities is of major importance.

Much research on adolescents' use of environments has focused upon desirable environments (van Andel, l990; Korpela, 1992; Lieberg, 1997), place preference (Malinowski and Thurber, 1996) and valued places (Owens, 1988; 1994). Examining valued and preferred

places enables the identification of the environments adolescents enjoy. As yet the relationship between preference and the frequency an environment is visited has not been explored.

Korpela (1989; 1992) found that his subjects often went to their favorite places to relax, to calm down, and to clear their minds after threatening or emotionally negative events. In addition, experiences of beauty, control, freedom of expression and escape from social pressures were reported.

Affordances are the possibility for action afforded to an observer by an object in the environment. Hence, this study is seeking to create affordances - in fact the

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possibility - for different activities in an environment so that they could meet the needs of the youth. These needs were classified according to Abraham Maslow's needs - physiological needs, safety needs, belonging needs, esteem needs, cognitive and self- actualization needs.

LITERATURE REVIEW

Optimal locations related to youth needs

The scope and the type of the young people needs might be innate or acquired, natural or unnatural. However, various needs and their development in youth are the reasons for movement and activities and a cause to achieve growth, physical and mental health and happiness and joy, and must be a concern to all planners.

As children become older, they grow increasingly aware of the opportunities presented by various settings and places for meeting their personal needs - for satisfying their desires for pleasure and stimulation or, conversely, for comfort or succorance. By asking young people about their place preferences, one gains insight into how they see their environments affecting them and the sorts of places that they would seek in order to meet their needs for pleasure and adventure, for stimulation, or for relaxation, refreshment, and renewal (Sommer, 1990).

Much research on desirable environments for adolescents were performed. Korpela (1992) and Lieberg (1997) revealed that home environment is a favorite place and that private places are more favorable than the public spaces. Some other findings have shown that young people prefer environments such as shopping centers, commercial places and the green spaces close to their homes. Owens (1988) interviewed 25 California 14 to 18 years old and asked them about the two outdoor places in their community that they valued the most. The most valued places were the nearby national park and undeveloped agricultural land, followed by the town park, places at home, places at school, views, commercial areas, and the communal greenbelt. From her own research, observations, and review of the literature, Owens concluded that the outdoor places that teenagers need and value are natural and undeveloped landscapes; gathering places; places to be alone; places that offer freedom and activity; places where they can see out but not be seen; and places that are safe, accessible, and can be called their own. Owens (1994) also examined why environments are valued and found that different environments are valued for different reasons. Mainly parks, commercial areas and school environments are valued. Owens (1994) did not specifically use the word "affordances"; rather, she matched the needs of the adolescent with the amount of support available in the environment for that specific need.

Duzenli et al. (2010) in their study had shown that adolescents prefer urban environments in which they can socialize with their friends and engage in various activities. It was determined that city centers and city parks are spaces that foster friendship relations between adolescents and promote development of social roles.

These findings indicate that the environment in which the age characteristics, needs and interests of the youth are well considered are desirable and attended properly. Adolescents spend their time in spaces they like, spaces that interest them, and spaces of their own choosing.

Gibson's theory of affordances

Environments have geographical and cultural characteristics with an internal relationship and support some behaviors in the same way. A set of environment affordances in a specific situation creates a potential environment for individual's behavior. All of these affordances are not understood by people and all understood affordances are not used (Lang, 2011).

Gibson's theory has been widely used by both perceptional and environmental psychologists. This theory is an approach that suggests seeking the functional meaning of the environment. Environmental affordances investigations help us to understand the different behaviors exhibited. Gibson's (1979) theory enables the functional properties of the environment and the psychological/behavioral response to the environment to be examined together. Theory of affordances is an environmental psychology method that helps explain "functional meaning" for adolescent environments and it is used to describe the relation between the functional features and the use of the environment. Gibson's theory of affordances states that environmental perception is a direct process and that perception takes that form of the individual perceiving affordances in the environment; 'The affordances of the environment are what it offers the animal, what it provides or furnishes either for good or ill'.

Affordances are therefore the possibility for action afforded to an observer by an object in the environment (Bruce and Green, 1993). Objects have instantly detectable functions and are perceived in terms of what they afford, not what properties or qualities they have. Gibson uses the term "affordance" as a tool for explaining the environment in the context and through the vocabulary of "activities". Among the various features of the environment, the ones that are defined as "affordances" are those that match the needs of individuals and assist them in their tasks (Fajen and Turvey, 2003). In summary, individuals perceive the affordances that have functional importance to them. In other words, the existence of an affordance requires cohesion between the individual and the environment (Withagen and Michaels, 2005). There are two main principles in Gibson's theory of affordances:

- Individuals and the environment are inseparable.
- Individuals perceive the environment directly, without

going through a mental process.

This theory supports the view that people and the environment are dependent on each other from an ecological perspective (Heft, 2001). Each environmental feature provides certain potential for a certain task, for certain individuals.

Gibson (1979) states that affordances can be physical such as a fire affording warmth, light and illumination but can also be provided by the presence of other people, for example social interaction, fighting and nurturing. In fact, Gibson believed that the richest and most intricate affordances of the environment are those provided by other people. These types of affordances are therefore distinguished from physical affordances by their social component.

One of the first environmental psychologists to utilize Gibson's theory to examine functionality was Heft (1988). Heft's aim was to create taxonomy for the significant properties of children's environments. Heft found copious examples of the potential affordances of children's environments and created taxonomy of children's outdoor environments. Heft's taxonomy aimed to classify children's environmental experiences. However, Heft's taxonomy failed to describe the affordances provided by other people in the child's environment; however, according to Gibson the affordances provided by other people are the richest affordances available of the theory. This is the weakness of Heft's work. Kytta (1995) used Heft's taxonomy and also included social interaction as an affordance type in the theory. In her study conducted on the affordances for children of different types of surroundings in Finland, Kytta (1995) asked each child "if there were such place, where would you like to do each type of affordance".

Environment affordances and meeting human needs

Motalebi (2001) describes that motivation is a guiding and organizing force of perception, cognition or purposeful human behavior. Behaviors come into action to meet the needs. Therefore, identifying human needs is very important for environmental designers. According to Maslow, human needs and motivations are innate and are born with them. Therefore, man relies on his innate motivations to find a way to fulfill his interests and carry out it willingly in order to satisfy special need. Thus, human tried to reach his needs through interaction with environment and changing its affordances and relying on his innate motivations, and he may make environment meaningful through changing different levels of environment and its affordances. In the built environment or particularly in architecture, we can identify different levels of environmental affordance proportionate to the above-mentioned human needs. In general, three different levels of affordances are recognized in the built environment and architecture by the perceiver:

1) Affordances which are necessary expected to physically interact with environment. This physical interaction provides the basic needs of people such as walking, eating, sleeping, etc.

2) Affordances which are required for communication, social interaction and interpersonal communication. At this level, architectural affordances are the mediators for encoding and decoding.

3) Affordances which are expected to satisfy symbolic and mysterious desires and interactions along with cultural and spiritual characteristics. Physical environment does not represent such meanings and affordances to other creatures other than human being (Motalebi, 2006).

Clark and Uzzell (2002) grouped the urban environments as home environment, neighborhood, school environment and city center; and they aimed to develop a scale that would measure the affordances of these environments. Affordances were measured to study two key adolescent needs; namely, need for social interaction and the need for retreat.

Jon Lang (2011), in his book "creating architectural theory", stated two models of human needs which are used by the designers to explain human affordances of the built environment. These two models are: the scale of essential emotions in competition by Alexander Leighton and hierarchy of human needs by Abraham Maslow. Although Maslow model is similar to Leighton model, it is more useful to design the environment. This classification provides a useful framework for environment design thought and issues concerned by designer. The built environment provides human biological needs such as shelter, safety needs including physical and psychological security, belonging and esteem needs through environmental symbolism; self-actualization needs through freedom of choice; cognitive needs through accessing to opportunities for growth and aesthetic needs through formal beauty.

Maslow's hierarchy theory of needs

In this research, in addition to meeting the most important needs of the youth which are prior to other needs, it is attempted to take meeting their needs into consideration and in this regard, We consider meeting the needs based on Maslow's hierarchy of needs. Maslow believes that needs could be arranged hierarchal or stepwise, so that every higher step represents higher need, but less essential for survival (Feist and Feist, 2002). The Lower level needs overcome higher level needs that means they must be satisfied first (Schultz and Schultz, 1998).

Maslow (1970) defines the first step of human needs as basic needs or physiological needs, the needs that provide human life whenever they are met. In Maslow's opinion, physiological needs are the most powerful and important human needs. Although these needs vary widely in different cultures, the most important ones are need to water, food, oxygen, sleep and rest.

If physiological needs are completely or partially

satisfied, safety needs including physical security, stability, affinity, protection and escape from threatening forces such as sickness, horror, anxiety, danger, and chaos will provoke them. Needing law, discipline and structure are safety needs. When people are not influenced and dominated by biological and safety needs, emanation and love and belonging needs come into action. In general, social interaction, emotional ties with friends and relatives and belonging to the spouse and children are some examples of this kind of needs. If affection and belonging needs are satisfied, people are free to follow their esteem needs which include self-esteem, self- confidence, competence and awareness of respect from others (Feist and Feist, 2002).

The most important need in Maslow's hierarchy of needs is self-actualization. If all lower level needs are met, but the person does not reach self-actualization which means fulfilling his potential capacities and talents, he will be feeling emptiness and failure (Maslow, 1970). Self-actualization needs mean self-perfection, fulfilling all talents and desire to get creative by all means. The needs that are mentioned here are Maslow's hierarchy of needs. In addition to these five needs, Maslow identifies two more needs including cognitive and virtuoso needs. Unlike effort needs, Virtuoso needs are not universal, but at least some people in every culture aroused by need to beauty and experiences which are pleasurable in terms of art. Human beings have art and effort needs as well as cognitive needs which means desire to learn, solving problems, understanding and being curious (Feist and Feist, 2002).

Therefore, meeting cognitive and virtuoso needs were considered in addition to basic needs in this center, in a way that in the built environment, virtuoso needs are met by formal beauty and cognitive needs are met by the environments predicted for meeting them.

This research mainly aims to design an environment for youth according to their needs and interests. This research is based on basic needs and cognitive needs of Abraham Maslow by environment affordances to meet all of the youth needs. The research questions are as follows:

1) Which of the basic needs and cognitive needs of the youth have priority, both in general and regarding the role of gender?
2) What kinds of affordances are provided by each suggested area in this center and what kind of youth needs could be met according to these affordances?
3) With regard to the highest priority need of the young people, what is the most favorable environment in their view point?

METHODOLOGY

Population and sampling

This research is conducted in the year 2013 and in district 9 of

Isfahan which is located in the west of the city. This city with a population of about two million people is located in the center of Iran, and in history, it is one of Iran's largest cities. The importance of this land is considered as its historical entity reaches the third millennium BC. According to the young people, aged between 18 and 25 years are located in the turning point adolescence. Thus, the population was considered of young boys and girls aged 18 to 25. In this study Morgan and Krejcie (1970) tables were used for the research sample. Morgan and Krejcie suggested a table to determine an accurate measured sample for a given sample space. Based on this table we have a sample of 377 from 2000 subjects and a sample of 379 from 3000 subjects. Since the number of young people from 18 to 25 is 23455 in district 9 of Isfahan in 2013, it is suggested that a representative sample of 380 subjects is sufficient; there are 196 girls and 184 boys in this representative sample and the sampling method was simple random sampling.

Research tools

Questionnaires were used for collecting data. In the questionnaire, physiological, safety, belonging, esteem, self-actualization and cognitive needs were introduced to the youth where they were asked about their prior needs to be satisfied. 8 different environments were chosen for designing in a center format for youths, who suggested zone for the construction of a center with an area of approximately 13 hectares, located in West of Isfahan. Some environmental affordances were considered for functional-meaning measurement of the environment. These affordances were selected based on the activities that meet 6 basic needs. Therefore, the introduced affordances were classified in 6 groups based on physiological, safety, belonging, esteem, self- actuali-zation and cognitive needs and were also measured for every environment. This questionnaire consists of 6 scales which include 6 basic affordances and every scale consists of 8 items. Each subject responds to the items of this questionnaire in a five-degree scale (always, often, sometimes, rarely and never).

The collected data by the questionnaires were investigated by SPSS software and ANOVA, Friedman and independent sample tests were applied for comparison and P-value less than 0.05 was considered statistically significant.

RESULTS

Priority of the youth needs

To meet youth needs and interests, sufficient recognition must be obtained of their needs and priorities. This study made an effort to use Abraham Maslow's model of human needs for general needs of youth. The result of analysis indicated that young people chose the physiological needs with the mean of 2.85, safety needs with the mean of 2.83, belonging needs with the mean of 3.20, esteem needs with the mean of 3.06, self-actualization needs with the mean of 2.53 and cognitive needs with the mean of 2.96. By conducting Friedman Test, it was determined that there were significant differences between needs ($x2= 39.032$, df= 5, p=0.000). Thus, the most important need in youth opinion was belonging needs for which they had more willing to be met. After belonging needs, esteem needs, physiological needs, cognitive needs, safety needs and self-actualization needs were chosen by young people.

Priorities of youth needs based on gender

Needs priorities were also studied based on gender. The results indicated that girls chose belongingness needs with the mean of 3.34, esteem needs with the mean of 2.98, cognitive needs with the mean of 2.95, safety needs with the mean of 2.90, physiological needs with the mean of 2.82 and self-actualization needs with the mean of 2.55.

Boys scored esteem needs with the mean of 3.14, belonging needs with the mean of 3.04, cognitive needs with the mean of 2.98, physiological needs with the mean of 2.88, safety needs with the mean of 2.76 and self-actualization needs with the mean of 2.50. Therefore, it is indicated that, with significant differences, girls had more willing to meet their belonging needs and boys had more willing to meet their esteem needs more than other needs.

Independent sample test was used to compare boys and girls and the results were as follows: There was a significant difference between boys and girls concerning meeting safety needs ($t=0.916$, $df=378$, $p=0.018$) and belonging needs ($t=2.03$, $df=378$, $p=0.043$). This value indicated that girls had more willing to meet these two needs compared to boys. There was also a significant difference between boys and girls concerning meeting esteem needs ($t=-1.09$, $df=378$, $p=0.010$). This value indicated that boys are more willing to meet esteem needs compared to girls.

There was no significant difference between boys and girls concerning meeting physiological, cognitive and self-actualization needs.

Affordances provided by suggested spaces

One of the most important purposes of this study was to define provided affordances by suggested spaces. By conducting the ANOVA Test, it was determined that there was a significant difference between the affordance chosen by the youth and other affordances for every environment. The results of ANOVA Test are presented in Table 1.

Selected affordance for every environment are as follows:

- The affordance of (first group) eating and drinking was provided in the restaurant with the mean of 4.56.
- The affordance of (second group) feeling safe and being alone was provided in the green space with the mean of 4.26 and the greenhouse with the mean of 4.14.
- The affordance of being with friends and meeting new friends (third group) was provided in the theater with the mean of 4.44 and in the educational space with the mean of 4.32.
- The affordances of gaining self-confidence and fame (forth group) was provided in the debate and discussion

space with the mean of 4.37 and in the foppery and meditations space with the mean of 4.15.
- The affordances of reaching perfection and ascension (fifth group) was provided in the worship space (the space of wisdom and insight) with the mean of 4.41.
- And finally, the affordances of learning (sixth group) was provided in the educational space with the mean of 4.54. These results are illustrated in Figures 1, 2, 3, 4 and 5.

DISCUSSION

People refer to the environment to satisfy their desires. Some of the environments may respond to the hidden and unconscious desires which may occur with the affordances of a specific model. This study was conducted to investigate some of the factors which should be considered while designing an environment for the youth. In fact this research makes an effort to describe needs, desires and priorities of the young people and the relationship between such factors and the youth environments.

In this study Gibson Theory was used to evaluate functional properties of the environment with the behavioral - psychological reflection to the environment. Gibson uses the term "affordance" as a tool for explaining the environment in the context and through the vocabulary of "activities" (Fajen and Turvey, 2003). Affordances are therefore the possibility for action afforded to an observer by an object in the environment (Bruce and Green, 1993).

In this study it is attempted to design a center with different environments that each one has its own specific affordances for the youth. Hence these environments, with their own affordances, suggest different activities which lead to meeting youth needs.

The model of Abraham Maslow's needs plays a leading role as a perfect model of needs so that the youth needs are investigated based on Maslow's needs. Physiological, safety, belonging, esteem, self- actualization and cognitive needs of the youth are analyzed and they express their inclination for meeting those needs with priority. Statistics indicated that belonging needs with the mean of 3.20 are the most important need for young people. Thus, young people like to spend their time with their friends and do social activities. This result is consistent perfectly with the cultural history of people of Isfahan city. This people from the cultural perspective are warm blooded and have a strong social relations. For example, houses in the city were designed in such a way that the several households are living side by side.

An important criterion for the determination of the needs of adolescents is gender differences, Garton and Pratt (1991) and Fitzgerald et al. (1995) state that girls are more interested in social entertainments than boys. Boys are more interested in social activities. Studies on Australian adolescents of 13-17 age range reveal that the

Table 1. The results of the one-way ANOVA test.

Affordances		Sum of squares	df	Mean square	F	Sig.
Eating and drink	Between groups	2438.489	7	348.356	216.172	.000
	Within groups	4885.989	3032	1.611		
	Total	7324.479	3039			
Feeling safe, Being alone	Between groups	1987.941	7	283.992	164.558	.000
	Within groups	5232.584	3032	1.726		
	Total	7220.525	3039			
Meeting with new people, being with friends	Between groups	1071.292	7	153.042	88.360	.000
	Within groups	5251.482	3032	1.732		
	Total	6322.773	3039			
To gain self - confidence and fame	Between groups	2526.265	7	360.895	217.317	.000
	Within groups	5035.208	3032	1.661		
	Total	7561.473	3039			
To reach perfection and ascension	Between groups	2580.197	7	368.600	218.357	.000
	Within groups	5118.203	3032	1.688		
	Total	7698.400	3039			
Learning	Between groups	2436.393	7	348.056	193.091	.000
	Within groups	5465.342	3032	1.803		
	Total	7901.736	3039			
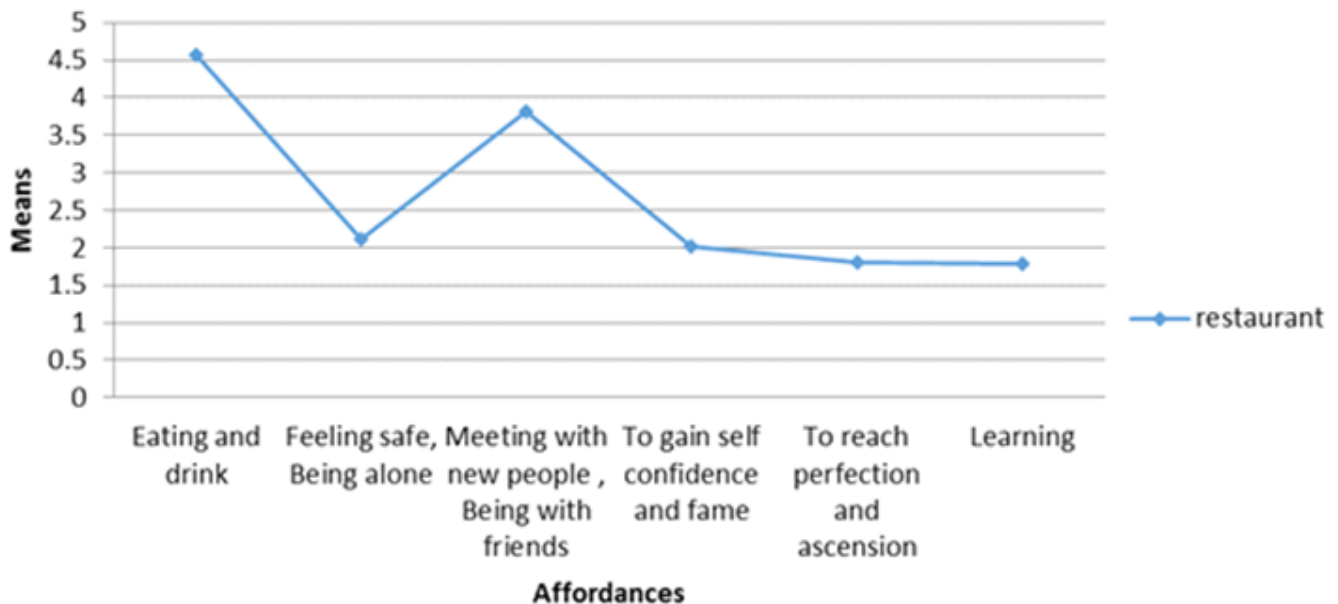
Figure 1. Determination of the affordances for restaurant.

most important activity is social events and spending time with friends. Boys are found to participate in sports and games more than girls. For Caffarella (2002), girls have different methods for growing and learning. Identity for girls is related with establishing relations with others, having close friends and intimacy. Tisdell (2003) suggests
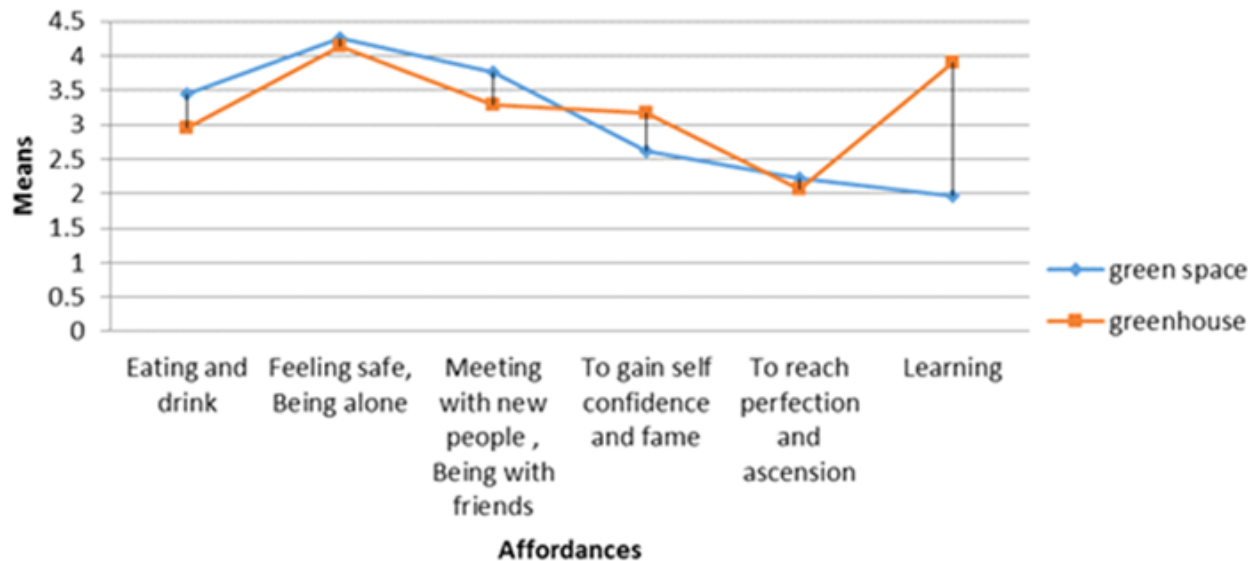
Figure 2. Determination of the affordances for greenhouse and green space.
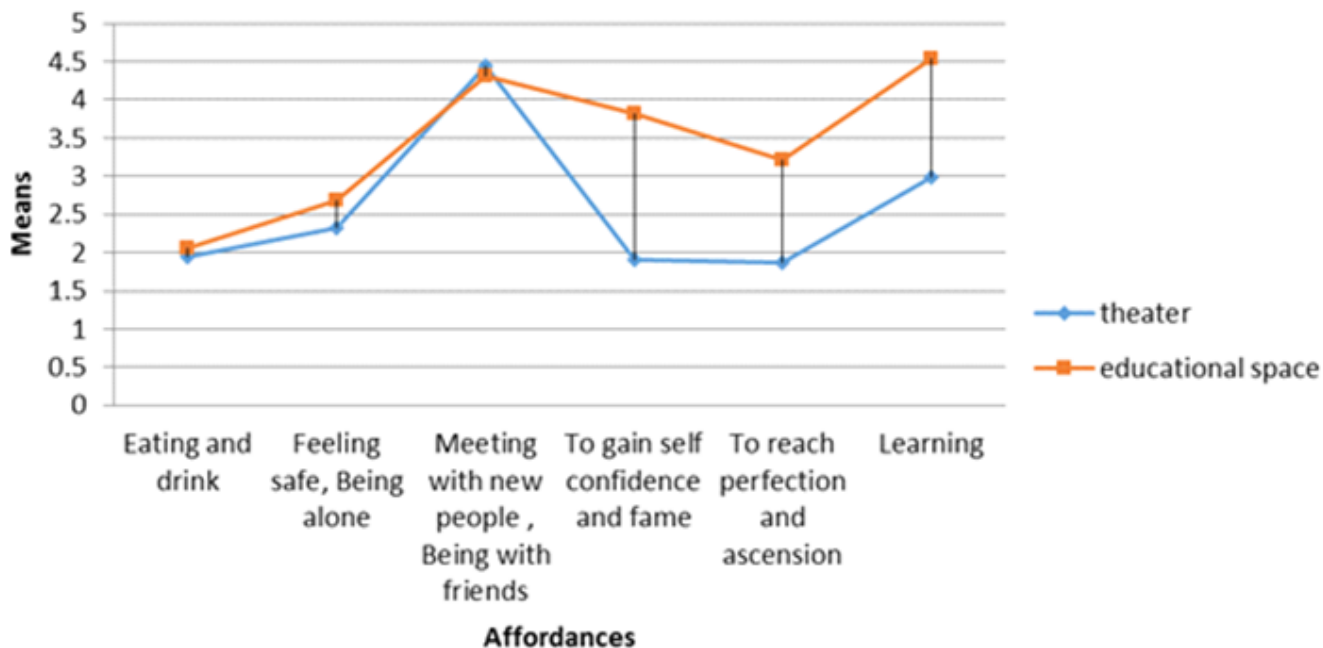
Figure 3. Determination of the affordances for theater and educational space.

that boys socialize particularly for leadership role and adopt an authoritarian style while girls play supporting roles. Duzenli et al. (2010) in their study have shown that girls prefer spending their time with their friends while boys prefer playing sports.

In this study, the needs priorities are investigated based on gender. The results indicated that girls chose belonging needs with the mean of 3.34. while boys chose

the esteem needs with the mean of 3.14. The statistics indicated that girls prefer to meet their belonging needs while boys prefer to meet their esteem needs more than other needs. In the study, restaurant, greenhouse, green space with seats, theater, educational space, self impro-vement and meditation space, debate and discussion space and worship space (the space of wisdom and insight) are introduced to the young people and some of
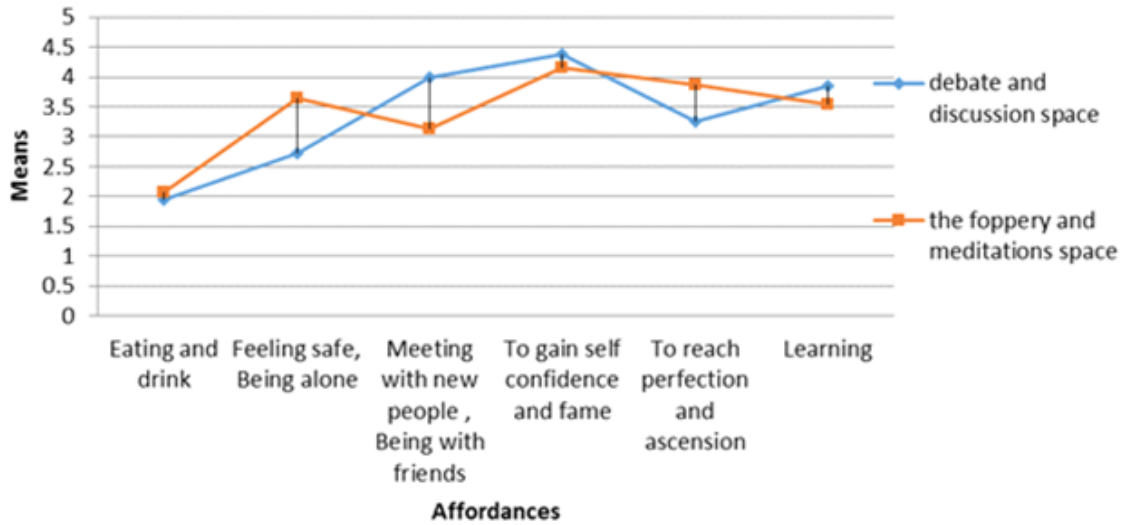
Figure 4. Determination ofthe affordances for debate and discussion space and foppery and meditations space.
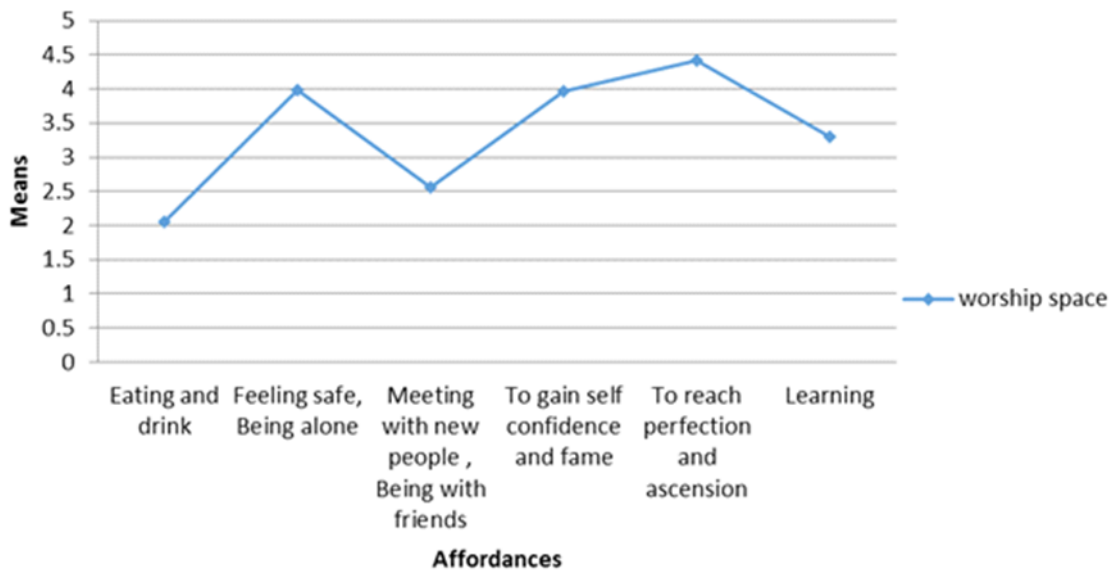
Figure 5. Determination of the affordances for worship space.

environmental affordances must be considered to mea-sure the functional properties of the environments; in a way that introduced affordances are classified to 6 groups according to physiological, safety, belonging, esteem, self- actualization needs and were measured for every environment, it is also determined that there is a significant difference between the affordances chosen for every environment compared to other environments.

The analyses indicated that young people participated in this survey chose (first group) eating and drinking affordances for restaurant with the mean of 4.56. These statistics indicated that this space with (first group) of

eating and drinking affordances support activities which lead to satisfying physiological needs of youth.

Young people scored the affordances of feeling safe and solitude for greenhouse with the mean of 4.14 and green space with seats with the mean of 4.26. Statistics showed that these 2 places with affordances of (second group) feeling safe and being alone support activities that lead to satisfying safety needs of youth.

Young people scored the affordances like being with friends and meeting new friends (third group) for theater with the mean of 4.44 and educational space with the mean of 4.32. Statistics indicated that these 2 places with

affordances of (third group) being with friends and meeting new friends support activities which lead to satisfying belonging needs of youth. The youth chose affordances (forth group) gaining self - confidence and fame for foppery and meditations space with the mean of 4.15 and for debates and discussion space with the mean of 4.37. Statistics indicates that these 2 places with the affordances (forth group) of gaining self - confidence and fame provide activities which lead to satisfying esteem needs of the young people. They also chose affordances (fifth group) of perfection and ascension for worship space (the space of wisdom and insight) with the mean of 4.41. This statistic indicated that this space with affordances (fifth group) of perfection and ascension support activities which lead to satisfying self - actualization needs of youth.

Finally the young people chose affordances (sixth group) of learning with the mean of 4.54 for educational environments. Statistic indicated that this space with affordances (sixth group) like learning provide activities which lead to satisfying cognitive needs of the youth.

Therefore, this research indicated the kind of Abraham Maslow's needs that will be met by every suggested environment to design a center according to their affordances and it is also determined that these environments may meet all of the Maslow's needs. The early stage of research indicated that satisfying belonging needs had priority for the youth and in the second stage, it is determined that theater with affordances (third group) of being with friends and meeting new friends provide activities which lead to satisfying belonging needs of youth. Thus, it can be concluded that theater is the most favorable place for youth in this center.

Space priorities of youth in order to meet their needs based on their gender are as follows:

Girls showed more inclination for meeting their belonging needs rather than other needs. As mentioned before, theater with affordances (third group) being with friends and meeting new friends, provide activities lead to satisfying belonging needs. Therefore, theater is the best place for girls in this center based on their own opinion, and boys showed more tendencies to meet their respect needs rather than others. Self improvement and meditations space and discussion and debate space with affordances of (forth group) gaining self - confidence and fame support activities which lead to satisfying esteem needs of the boys . Thus, these 2 places are the best space in this center for boys.

In this study affordances of every environment were specified by the young people and then it was indicated that which environment meets what kind of youth basic needs and what the best environment is with regard to meeting their needs. This study showed that youth have an inclination for meeting their belonging needs rather than other needs. They like to have social interactions with their friends. These are results which can be useful

while designing an environment for the young people. It is important to evaluate the environment from the pers- pective of adolescent development. To accelerate this development process and to improve its impact on character development, it is essential that we create spaces with the right characteristics for adolescents to spend their times in.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Research on the mechanisms of big data on consumer behavior using the models of C2C e-commerce and countermeasures

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The purpose of this study is to investigate the mechanisms of big data on consumer behavior on the models of C2C e-commerce. From the beginning of the following five aspects: recommendation system, information search, reputation system, virtual experience and security system, the paper discusses some factors that affect buying intention in C2C e-commerce under big data. It fully considers the characteristics of big data, and then constructs the behavioral decision-making model of C2C e-commerce consumers, especially the factors of perceived usefulness, perceived risk and trust are integrated into the model of this research. We conduct the survey method and collect 245 valid questionnaires on consumers in each area in Shanghai and online using the quota sampling method. The empirical data show that it has six hypotheses being rejected, and others are supported in 20 hypotheses. According to the results, the paper also discusses why these hypotheses are not supported and give some marketing countermeasures in order to help the e-commerce enterprises better respond to the challenges of big data.

Key words: Big data, C2C e-commerce, behavioral decision-making model, mechanisms, countermeasures.

INTRODUCTION

The aim of the paper is to highlight the relationship among perceived usefulness, perceived risk, trust and consumer's buying intention. This relationship is viewed as a significant issue in the field of consumer behavior since the heat of research on big data by enterprises and academia is increasing year by year. The potential value of this paper is to provide discussion platform in the field of consumer behavior. From the start of the recommendation system to the popular social media marketing recently, these all prove that the mode of C2C e-commerce has taken a great change at the background of this era. According to the characteristics and development of big data on the models of C2C e-commerce, our paper builds up a conceptual framework among security system, reputation system, recommendation system, information search, virtual experience, perceived usefulness, perceived risk, trust and consumer's buying intention and supply an expected causal relationship in

order to explore their corresponding relationship attributes.

The development of big data and related technologies has brought huge impacts on the traditional network marketing.

By collecting different data of Internet users in this era, such asattribute data on geographic distribution, real-time data on search phrases, behavioral data on shopping and browsing behavior, as well as social data on hobbies and social connections, enterprises can achieve geographical orientation, demand orientation, preference orientation, relationship orientation and other directional ways in the advertising push, realize precision and personalized marketing. Additionally, they can achieve commodity push across different platforms and terminal by the integration of big data. However, compared with the relatively mature commercial practice, theoretical research on what a fundamental shift in consumer behavior in C2C e-commerce at the background of big data is relatively backward, and it has not caused widespread interest and concern by scholars. Therefore, it is necessary to carry out this research.

Perceived usefulness means the users subjectively think that using this system can improve the degree of their job performance. There are many areas researching the influence of perceived usefulness currently. In technology promotion, Snchez and Hueros (2010) found that perceived usefulness can affect the user attitudes and thus indirectly alter the user behavior in the applications of new technology or a new form of business promotion. In the library management, Wang and Guan (2010) applied gap theory, and verified that perceived usefulness played an important role in improving service quality of university library from three aspects of service quality, information quality and online system quality by empirical analysis. In network marketing, combining the theory of environmental psychology and TAM, Koufaris and Hampton (2002) explained the consumer behavior of online shopping. He considered that perceived usefulness in TAM had more significant influence on consumer behavior of online shopping compared to other factors. From the research of previous people, we can find that the key determinant is perceived usefulness of consumers whether consumers are willing to accept a new information systems or technology in TAM.

The original concept of perceived risk was proposed by the Harvard University, professor Raymond Bauer in 1960. He believed perceived risk was actually that any purchasing behavior of consumers was likely to lead to its own unpredictable results (Bauer, 1960). From the perspective of expectancy theory, Wang et al. (2003) thought that perceived risk is expectations of withstanding the loss of consumers on a predictable result. In the area of e-commerce, it often comes with the issue of infor-mation asymmetry. This information asymmetry makes the consumer at a disadvantage when online shopping

and its decisions need to face a lot of risks and uncertainties (Cha, 2006). From six dimensions of social risk, privacy risk, economic risk, time risk, performance risk and psychological risk, Featherman and Pavlou (2002) researched the consumer acceptance of e-commerce. Doolin and Stuart (2005) also confirmed the relationship between perceived risk and consumer behavior decision of online shopping by empirical research. Therefore, this paper views perceived risk as one of the intermediate variables to research the consumer behavior in C2C e-commerce at the background of big data.

In the emerging e-commerce, more and more people pay attention to trust. Todd (2011) believed that trust was the consumer perception of the business commitments and consumer awareness of the business honest behavior. Lee and Turban (2010) confirmed the trust tendency of consumers would act on trust through three factors of safety factors, online shopping environment, trustworthiness of online businesses together. Walczuch and Lundgren (2004) mainly research the psychological determinants of consumers on online shopping trust, including those based on perception factors, experience factors and knowledge factors. Gordon et al. (2006) pointed out that customer trust is a key factor in the success of mobile e-commerce. Therefore, this paper views trust as one of the intermediate variables to research the consumer behavior in C2C e-commerce at the background of big data.

LITERATURE REVIEW AND HYPOTHESIS SETTING

This framework is mainly derived from Davis (1986) and it is mainly used to research the behavior of people accepting information systems. TAM considers that the behavior of individual use information systems is determined by the behavioral intention of use information systems. In the area of e-commerce, the first person who introduced TAM into this field is Judy and Lin (2000). They used TAM to explain consumer acceptance of shopping sites. Then TAM is extended by Pavlou (2003). They introduced trust and perceived risk into TAM in order to predict consumer acceptance of e-commerce. Leo (2010) added subjective norms variable of Theory of Planned Behavior (TPB), variable of Innovation Diffusion Theory (IDT), variables of privacy, security and self-efficacy based on TAM to predict consumer acceptance of online shopping. However, with the scale of online shopping in the proportion of social spending increased year by year; C2C has become an important part of online shopping and major business types. User consumption habits, behavior habits, browsing habits and search habits also have experienced a complex evolution. Such huge data and amazing growth represent a new challenge to interpret the data and accurate insight into
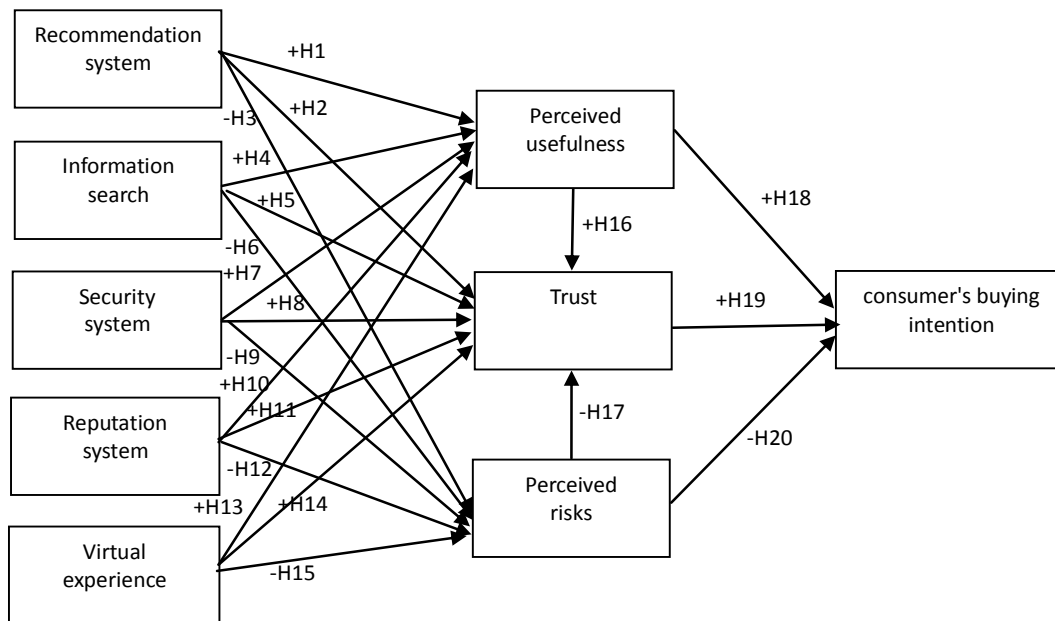
Figure 1. Research framework.

customer needs. A variety of information has had some positive and negative effects on consumer behavior and habits. Combined with research angles of many scholars at home and abroad, as well as the long-term online shopping practices and observation of the authors, the authors select out five influencing factors: security system, credit system, recommendation systems, information search and virtual experience, and proposed an integrated model to explore the effects of big data on consumer behavior on the models of C2C e-commerce. Figure 1 displays the conceptual framework of this study.

Effects of recommendation system on perceived usefulness

In the era of big data, the consumer can not directly confront with retailers. What is more, product differen-tiation gradually decreases. These two factors resulted in businesses lacking understanding of consumer preferences and consumer hesitation of choosing goods. Komiak and Benbasat (2006) once experimentally verified that individuation of products recommendation would affect consumer trust, thereby affecting consumer perceived usefulness of products recommendation.

Xiao and Benbasat (2007) suggested that the presentation of products information would affect consumer purchase decisions, thereby affecting consumer emotional perception of the site. Therefore, the research assumes:

Hypothesis H1: The more perfect recommendation

system is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.

Effects of recommendation system on trust

Komiak and Benbasat (2003) found that interface design based on the demand dialogue can increase user trust beliefs of personalized recommendations, thereby affecting the user plan of adopting the personalized recommendation as an aid of decision-making. Based on the information of customer purchasing behavior, browsing behavior and evaluation of goods, C2C recommendation system learns the customer's interest to do commodity matching, and then recommends goods to customers.

Information richness, the accuracy and reliability of goods have an impact on generating perceived trust of consumers, thereby affecting the purchasing behavior. Therefore, the research assumes:

Hypothesis H2: Recommendation system has positive effect on consumer trust.

Effects of recommendation system on perceived risk

Using recommendation system to obtain information can reduce the browsing pressure because of overload information, and perceived risk of the users can be reflected by the user judgment of the experience of recommendation system (Liang et al., 2006). Thus, the

intention of using recommendation system to obtain information reflects the value judgment, perception and experience of users on recommendation system. Recommended system provides consumers with information such as expert reviews and consumer reviews, which will shake consumer evaluation and attitudes of goods in varying degrees. Therefore, the research assumes:

Hypothesis H3: The better recommendation system is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.

Effects of information search on perceived usefulness

According to the model of availability - diagnosability, reputation information of high quality the consumer can help consumers identify and locate the products or service being evaluated accurately because of the clear, substantial and credible content; it has diagnosis of high capacity. Due to the exponential growth of data, consumers often get information through an external search at the background of big data. Childers et al. (2010) found that the emotional experience of consumers had an impact on their attitudes in the information searching process of online shopping, and this emotional experience often comes from the external searching process of others' comments. Therefore, the research assumes:

Hypothesis H4: The better information search is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.

Effects of information search on trust

Yao (2009) found that the satisfaction of information search had a positive impact on the perceived usefulness, safety and consumer trust. In big data environment, when the amount of data reaches a certain level, the query reaches a certain number and many people inquire at the same time; it will usually take a long time to find the data which they need from a database. If consumers can quickly search the products information they need, the cost of time will get corresponding reduction, thereby producing the trust. Therefore, the research assumes:

Hypothesis H5: Information search has positive effect on consumer trust.

Effects of information search on perceived risk

Consumers mainly collect the products information through online information. In big data environment,

consumers click to know the products information they need like the ocean of information. Consumers can search for the information they are interested in by themselves, select and browse from a lot of information and utilize the information comprehensively, in order to form their own judgments of a product or service and make the initiative of online transactions grasp in their own hands. Therefore, the quickness and safety of online information collection increase the perceived value of online shopping. Therefore, the research assumes:

Hypothesis H6: The better the information search is, the lower the consumers' risk perception of C2C e-commerce is in the big data environment.

Effects of security system on perceived usefulness

C2C is a virtual and non-face trading form of business transactions; its security of trading information had been consumer concern. Cyberspace covered a broad range of data sources, such as sensors, social networks, record archiving, e-mail; a large collection of data inevitably increased the risk of user privacy leaks (Feng, 2013). CNNIC surveyed to find that 89.2% of the e-commerce site visitors worried about fake websites, in which 86.9% of people said that if they could not get further confirmation of this website, they would choose to drop out the deal (Gold, 2010). So consumers will greatly reduce the perceived usefulness of the website when their perceived security cannot reach their expectations. Therefore, the research assumes:

Hypothesis H7: The better the security system is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.

Effects of security system on trust

Lu and Zhou (2005) showed that website security had a significant impact on initial establishment of online consumer trust. Shao et al. (2006) also believed that the measures of the website privacy protection and security control had a significant impact on the trust. Pavlou (2003) studied to find that perceived security also had a significant impact on the trust. In C2C online shopping, the safety of commodity distribution, quality, transaction, payment, privacy, safety and after-sale service and other security systems had a great relationship with whether online consumers trust or not. Therefore, the research assumes:

Hypothesis H8: Security system has positive effect on consumer trust.

Effects of security system on perceived risk

In a virtual network environment, customer had full uncertainty in the purchase of products and service (Gefen D, 2000). Consumers would be asked to provide personal information such as name, address, and credit cards to complete the online transaction (Hatlestad, 2001). The utilization of big Data will make the service suppliers collect customer information and even monitor the consumers under the circumstance of consumers who do not know and agree. This will lead to the consumer privacy leaks. Consumers often worry that their trading information will be attacked by hackers and invaded by viruses. Therefore, the research assumes:

Hypothesis H9: The better the security system is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.

Effects of reputation system on perceived usefulness

The utilization of e-commerce websites broke down the boundaries of distance, but increased the asymmetry of consumer purchase information (Mcknight, 2002). This asymmetry of information had a tremendous impact on perceived usefulness of consumers. Resnick and Zeckhauser (2002) considered that the design of reputation feedback system could minimize the fraudulence and reduce the behavior of network fraudulence in e-commerce transactions, thereby improving the perceived usefulness. Kiku and Leonard (2002) pointed out that the reputation after several trading behavior would further affect the credit behavior; reputation had become an indispensable factor of online shopping applications. Therefore, the research assumes:

Hypothesis H10: The better the reputation system is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.

Effects of reputation system on trust

Many scholars have come to a similar conclusion about the research on seller prestige and reputation. They thought that seller prestige had a positive impact on the Trust of online consumers. Chrysanthos (2003) considered that prestige would become an important reference index of consumer choice with the same kind of merchandise. The results of domestic scholars (Lu and Zhou, 2005) also showed prestige had a significant effect on initial establishment of online consumer trust. Therefore, the research assumes:

Hypothesis H11: Reputation system has positive effect on consumer trust.

Effects of reputation system on perceived risk

Non- face to face communication between consumers and sellers in C2C platform results in the importance in communication between buyers and sellers and the evaluation recognition extent of other consumers on sellers. Serious problems such as false propaganda, inconsistent quality with introduction, poor after-sales service have affected the purchasing behavior of consumers. In order to reduce the risk, consumers generally prefer the e-business with high reputation. Therefore, the research assumes:

Hypothesis H12: The better the reputation system is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.

Effects of virtual experience on perceived usefulness

Virtual experience is sensory stimulation generating the virtual and real thinking space; it is a collection of many emotions and thinking such as emotional information and psychological phenomena. It is also a collection of changes in consumers' unique physical and psychological factors (Yao, 2009). From the perspective of consumer demand, Cao and Yu (2010) thought that the experience of virtual products is the promotion of online shopping from purchasing the products of meeting their own needs to purchasing the products of suiting their own characteristics. Therefore, the research assumes:

Hypothesis H13: The better virtual experience is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.

Effects of virtual experience on trust

According to the user trust of virtual shopping, acceptance intention and willingness to pay for personalized recommendation service, Urban et al. (2009) found that most people trust and accept virtual shopping.

Theory of reasoned action says that a person's consequence assessment of an act will affect his behavior and attitude. In the research, behavior and attitude correspond to consumer trust. The corresponding behavior is completing online shopping in C2C e-commerce.

Consumer satisfaction of purchasing products in the past determines online shopping attitudes held by different trust. Therefore, the research assumes:

Hypothesis H14: Virtual experience has positive effect on consumer trust.

Effects of virtual experience on perceived risk

Experience is a response to communication among customer, product or service, enterprises and representatives. Positive response would encourage consumers to approve the value of products or service (La et al., 2003). Rich experience content of the website would make consumers spend more time in cyberspace, and immerse in the network experience, as well as they would generate a positive perception (Chen, 2006). When participating in experienced activities, enjoyment of the process, feeling and good or bad fantasy would affect the customers' assessment (Yao, 2006). According to previous studies, the research assumes:

Hypothesis H15: The better virtual experience is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.

Effects of perceived usefulness on trust

Trust is the statement of the nature of people, events or objects, or a fact. The statement is thought to be reliable or trustworthy. Some academics have also explored the relationship between perceived usefulness and trust between. Koufaris and Hampton (2002) considered that perceived enjoyment would have a positive impact on trust by perceived usefulness and perceived ease of use when consumers shop online through the website. Therefore, the research assumes:

Hypothesis H16: There is a positive relationship between consumers' usefulness perception of C2C e-commerce and consumer trust.

Effects of perceived risk on trust

The influence of perceived risk on trust has also been confirmed by scholars. In online shopping environment, perceived risk was considered to have a negative impact on trust (Kimery and McCord, 2002). Heijden (2003) considered that the reduction of perceived risk could indeed increase the trust and attitudes of online shopping, thus increasing the online shopping intentions of purchasers. Therefore, the research assumes:

Hypothesis H17: There is a negative relationship between consumers' risk perception of C2C e-commerce and consumer trust.

Effects of perceived usefulness on consumer's buying intention

Perceived usefulness is the subjective evaluation that a

new technology can bring benefits for their own from the users' psychological levels. Logically speaking, it is only when people feel a technology can help their work and life will they use technology. According to the TAM, perceived usefulness could affect consumer behavior (Davis, 1989). In addition, other scholars have confirmed the existence of this effect (Yang et al., 2006). Therefore, the research assumes:

Hypothesis H18: There is a positive relationship between consumers' usefulness perception of C2C e-commerce and consumer's buying intention.

Effects of trust on consumer's buying intention

Wang and Emurian (2011) thought that the present and future development of e-commerce would be vulnerable for the lack of an atmosphere of trust. The empirical result by Gefen et al. (2003) showed that consumer familiarity and trust of the e-commerce website and its process had brought a significant positive effect on consumer buying behavior. The research by Heijden (2003) showed the same result. Trust would determine the consumer's buying intention by affecting the attitudes of consumers. By studying 45 researching papers in the academic journals, Chang et al. (2005) found that lack of trust was a major obstacle to online shopping. As the research is conducted in the context of big data, the trust factor is necessary as an important factor affecting the decision-making of consumer behavior. Therefore, the research assumes:

Hypothesis H19: Trust has positive effect on producing consumer's buying intention.

Effects of perceived risk on consumer's buying intention

There are some studies to verify the influence of perceived risk on consumer's buying intention. Kimery and McCord (2002) demonstrated that perceived risk of consumers had a negative impact on purchase intentions in e-commerce environment. Kuhlmeier and Knight (2005) found that there is a negative relationship between perceived risk and buying intention by studying the antecedents of online shopping. The utilization of big data is full of uncertainties. If customers have high perceived risk of uncertain factors, it will hinder the buying behavior of customers. Therefore, the research assumes:

Hypothesis H20: There is a negative relationship between consumers' risk perception of C2C e-commerce and consumer's buying intention.

METHOD

Survey method

In our study, we use quota questionnaire as our sampling method and the sample presents the population characteristics. The sample is drawn from consumers in Shanghai. First, we compute the number of questionnaires that will separately be circulated in each area of Shanghai. Second, we circulate the questionnaire on the internet through the questionnaire star and chatter, such as QQ, Wechat. A total of 300 questionnaires were distributed for this research, 245 questionnaires were recycled, and the rate of recycling was 81.7%. After the consistency inspection, 43 copies of invalid questionnaires were dropped out, 202 valid questionnaires were retained, and the valid rate of recycling was 82.4%.

Measurement

There are nine variables in our research study, which are independent variables (security system, reputation system, recommendation system, information search and virtual experience); intermediary variables (perceived usefulness, perceived risk and trust); dependent variables (consumer's buying intention). Our questionnaire refers to the literatures by foreign and domestic researchers and employs a 5-point Likert scale to measure each variable by the items in the questionnaire. The range is from "strongly disagree" to "strongly agree." Among them, "1" represents "strongly disagree," "5" represents "strongly agree."

EMPIRICAL RESULTS

Descriptive statistics

Table 1 shows the descriptive analysis of the samples based on the recycled questionnaires. From it, we can see that men account for 41.1% and women account for 58.9% in terms of gender in the valid samples, indicating that women consumers have a larger proportion in C2C e-commerce at the background of big data. In terms of age, the ages between 18 to 45 account for 89.6%, indicating that consumers are dominated by middle-aged and youths in this environment. In terms of marital status, the proportion of married and single is 48 and 52%, indicating that consumers have little difference in marital status in this environment. In terms of educational background, the proportion of junior college degree is 92.6%, indicating that the vast majority of consumers are the people who have a higher level of knowledge in this environment. In terms of occupation, the proportion of commuters in the samples is 28.2% and the proportion of the students is 71.8%, indicating that most consumers are students in this environment. In terms of durable years of Internet, sample proportion of 5-7 years reaches more than half, indicating that this is similar to the development of C2C e-commerce. In terms of the average time of day online, the samples were mainly concentrated on the range of 1-4 hours, indicating that the network activities take up a lot of entertainment and leisure time out of work. In terms of online shopping experience, 92.1% say they have online shopping experience, indicating that the coverage of C2C e-commerce has been quite extensive at the background of big data.

Reliability analysis and convergent validity analysis

According to nine factors and 43 indicators in the decision-making model, the research uses the Cronbach's α coefficient to make the reliability measurements. The purpose is to verify the reliability of the questionnaire. According to Formell and Larcker (1981), a composite reliability larger than 0.6 indicates an acceptable fit of the data. Hence, the higher the value of Cronbach's α, the greater the internal consistency and reliability in our questionnaire will be. The results of this research are shown in Table 2. The Cronbach's α value of most variables are all above 0.7, and the Cronbach's α value of each variable does not change significantly in the deletion of a single indicator, indicating that the questionnaire reliability is good.

In addition, the research uses the indicator of factor loading to evaluate the validity. We apply the LISREL model to analyze the results. From Table 2 we can see that all completely standardized factor loading are greater than 0.5 and reached a significant level (ρ <0.05 or ρ <0.001), indicating that it has a high degree of convergent validity between each variable and indicator.

Fit indices of the proposed measurement model

In the Lisrel model, we adopt various fitness indices to examine the validity of the model and fit indices of the proposed measurement model are shown in Table 3. In our model, we calculate that the $\chi2/df$ is 2.15 between 2 and 5. The goodness-of fit index (GFI) is a measure of the relative amount of variance and covariance in sample data that is jointly explained by sample data (Joeslog and Sobom, 1984). If the model possesses a good fit, then the value is usually above 0.90. Note shows that it is 0.91. In our model, *CFI* is 0.94, *NNFI* is 0.97, *NFI* is 0.92, *GFI* is 0.91, and *IFI is* 0.93, individually. Moreover, *Root mean* square *error* of *approximation* (RMESA) provides information about the fit of the model with unknown but optimally chosen parameter values for the population covariance matrix, if it is available (Bagozzi and Yi, 1988). In our study, the RMSEA is 0.052, which indicates a good fit. Consequently, our model is well-settled (Anderson and Gerbing, 1988).

The results of the structural model

The research uses the software of AMOS 17.0v to make

Table 1. Sample structure.

Feature variables	Category	Sample size	Percentage	Feature variables	Category	Sample size	Percentage
Gender	Male	83	41.1%	Occupation	Commuters	57	28.2%
	Female	119	58.9%		Students	145	71.8%
Age	Under 18	14	7.0%	Durable years of Internet	Within a year	2	1.0%
	18-25	129	63.9%		2-4 years	35	17.3%
	26-35	40	19.8%		5-7 years	106	52.5%
	36-45	12	5.9%		More than 8 years	59	29.2%
	Up 45	7	3.4%		Less than 1 hour	9	4.5%
Marital status	Married	97	48.0%	The average time of day online	1-2 hours	51	25.2%
	Single	105	52.0%		2-3 hours	78	38.6%
Educational background	High school	15	7.4%		3-4 hours	46	22.8%
	Junior College	49	24.3%		More than 4 hours	18	8.9%
	Undergraduate	82	40.6%	Online shopping experience	Yes	186	92.1%
	Graduate	56	27.7%		No	16	7.9%

Data source: This study.

Table 2. The results of each variable reliability and validity test.

Variables	Index	Cronbach Alpha if item is deleted	Cronbach Alpha	Factor loading	variables	Index	Cronbach Alpha if item deleted	Cronbach Alpha	Factor loading
Security system	SC1	0.812		0.88	Information search	IS1	0.732		0.65
	SC2	0.836		0.85		IS2	0.765		0.77
	SC3	0.841	0.873	0.81		IS3	0.724	0.834	0.62
	SC4	0.832		0.74		IS4	0.787		0.68
	SC5	0.827		0.83		IS5	0.802		0.61
	SC6	0.794		0.69		IS6	0.813		0.73
Recommendation system	RS1	0.849		0.83	Virtual experience	VE1	0.759		0.69
	RS2	0.846		0.86		VE2	0.786		0.65
	RS3	0.838	0.865	0.72		VE3	0.809	0.764	0.81
	RS4	0.841		0.71		VE4	0.683		0.80
	RS5	0.796		0.77		VE5	0.712		0.77
	RS6	0.818		0.78		VE6	0.743		0.74
Reputation system	RP1	0.783		0.86	Perceived usefulness	SC1	0.831		0.63
	RP2	0.845		0.71		SC2	0.785	0.825	0.68
	RP3	0.851	0.855	0.81		SC3	0.821		0.85
	RP4	0.849		0.67		PR1	0.695		0.70
	RP5	0.786		0.83	Perceived risks	PR2	0.793		0.80
	RP6	0.847		0.78		PR3	0.827	0.841	0.82
buying intention	PW1	0.774		0.81		PR4	0.818		0.76
	PW2	0.781	0.817	0.66		TR1	0.852		0.78
	PW3	0.769		0.75	Trust	TR2	0.786	0.858	0.82
						TR3	0.801		0.61

Data source: This study.

Table 3. The fitting results of structural equation model.

Project type	Fitting index	Judging criterion	Results of this research	Conformity between results of this research and ideal results
Absolute fitting index	χ2/df	2.0<χ2/df <5.0	2.15	Yes
	GFI	>0.90	0.91	Yes
	RMSEA	>0.05	0.052	Yes
Value-added fitting index	NFI	>0.90	0.92	Yes
	CFI	>0.90	0.94	Yes
	IFI	>0.90	0.93	Yes
Simple fitting index	PGFI	>0.50	0.53	Yes
	PNFI	>0.50	0.52	Yes

Data source: This study.

the structural equation model analysis for the hypothesis and then verify the proposed hypothesized relationships, using the maximum likelihood estimation method (ML) to fit the model. The concrete data are shown in Table 3, each fitting index value reaches the criteria.

Based on the good model fitting, the research tests the hypothesized relationship through the path relationship. Path relationship is mainly shown by standardized coefficient relationship. The bigger the coefficient is, the greater the importance is in causality. As shown in Table 4, among 20 hypothesis of the research, six hypotheses (H2, H3, H5, H6, H14, H15) do not reach the significant levels and be rejected, others reach the significant level. Ultimately, the modified decision-making model of C2C e-commerce consumer behavior in the environment of big data is formed (Figure 2).

Empirical analysis of models

The research makes the theoretical hypothesis and empirical analysis for the factors that affect the decision-making model of C2C e-commerce consumer behavior in the environment of big data. It focuses on validating the influence of perceived usefulness, trust and perceived risk on consumer's buying intention (behavior). Based on the TAM, the research constructs the decision-making model of C2C e-commerce consumer behavior in the environment of big data and uses the structural equation model to verify the 20 hypotheses, whose six hypotheses (H2, H3, H5, H6, H14, H15) were rejected, and others supported by the empirical data. Hypothesis 2 (recommendation system has a positive impact on consumer trust) is rejected. The reason is that the information of goods and discount push result in meeting the consumer demand unseasonably because of the time difference

and asymmetric information. Therefore, it cannot have an impact on consumer trust. Hypothesis 3 is rejected; the reason may be that recommendation system simply pushes based on the previous goods searching information and shopping information, and does not have much impact on consumer privacy. Therefore, it does not have obvious relative relationship between them. Hypothesis 5 (Information search has positive effect on consumer trust) is rejected; one of the possible reason is that the number of consumers accepting the information will affect the pleasure in the process of shopping, and there is no direct impact on consumer trust. Therefore, the hypothesis is not significant. Hypothesis 6 (The better information search is, the lower consumers' risk perception of C2C e-commerce is in the big data environment) is rejected; the possible reason is that in the middle of information search, perceived risk has two or even more than two variable as an intermediary, so that the relationship between them is not significant. Hypotheses 14 (Virtual experience has positive effect on consumer trust) and 15 (The better virtual experience is, the lower consumers' risk perception of C2C e-commerce is in the big data environment) are rejected; the reason may be that consumers' awareness of the virtual experience is very vague. They just know that it can help them better select products. In all the hypotheses supported, the significance of hypothesis 17 (negative relationship between consumers' risk perception of C2C e-commerce and consumer trust) is the most prominent, indicating that perceived risk has a great influence on the consumer trust in the environment of big data. Also, it shows perceived risk plays a very important role in the decision-making process of consumers' buying behavior. From the significant level of hypotheses 19 (Trust has positive effect on producing consumer's buying intention) and 20 (negative relationship between consumer's risk

Table 4. Inspection results of structural equation of hypothesized relationship.

Hypothesized content	Coefficient	Level ρ	Result
H1:The more perfect recommendation system is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.	0.431	***	Supported
H2:Recommendation system has positive effect on consumer trust.	0.063	0.642	Rejected
H3:he better recommendation system is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.	-0.103	0.583	Rejected
H4:The better information search is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.	0.552	**	Supported
H5:Information search has positive effect on consumer trust.	0.003	0.782	Rejected
H6:The better information search is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.	-0.054	0.562	Rejected
H7:The better security system is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.	0.382	**	Supported
H8:Security system has positive effect on consumer trust.	0.458	***	Supported
H9:The better security system is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.	-0.231	*	Supported
H10:The better reputation system is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.	0.203	**	Supported
H11:Reputation system has positive effect on consumer trust.	0.392	**	Supported
H12:The better reputation system is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.	-0.494	**	Supported
H13:The better virtual experience is, the higher consumers' usefulness perception of C2C e-commerce is in the big data environment.	0.309	*	Supported
H14:Virtual experience has positive effect on consumer trust.	0.007	0.705	Rejected
H15:The better virtual experience is, the lower consumers' risk perception of C2C e-commerce is in the big data environment.	-0.005	0.692	Rejected
H16: There is a positive relationship between consumers' usefulness perception of C2C e-commerce and consumer trust.	0.276	**	Supported
H17: There is a negative relationship between consumers' risk perception of C2C e-commerce and consumer trust.	-0.786	***	Supported
H18: There is a positive relationship between consumers' usefulness perception of C2C e-commerce and consumer's buying intention.	0.386	***	Supported
H19:Trust has positive effect on producing consumer's buying intention.	0.674	***	Supported
H20: There is a negative relationship between consumers' risk perception of C2C e-commerce and consumer's buying intention.	-0.623	**	Supported

Data source: This study.

perception of C2C e-commerce and consumer's buying intention), perceived risk also has effect. From these two hypotheses, we can see that the influence of perceived risk and trust on consumers' behavior in decision-making in C2C e-commerce at the background of big data is more prominent compared to perceived usefulness. These hypotheses tell us that C2C e-commerce merchants and platforms should take effective measures to reduce the perceived risk of consumers and increase consumer trust when they are marketing in the era of big data. For example, they can increase the business supervision and establish effective evaluation criteria of shops, thus improving loyalty and satisfaction of C2C consumers.

Other hypotheses are also significant, indicating that not only do C2C e-commerce merchants and platforms need to reduce the perceived risk of consumers and increase consumers' trust by constructing a stable security system and perfect reputation system; also they need to design good system of products recommendation, improve the function of information search and popularize the goods function of virtual experience. The purpose is to enhance the consumer's perception of usefulness. These measures are the changes that the special environment brings for behavioral decision-making of C2C e-commerce consumers. Enterprises and platforms should be aware of the changes and develop corres-ponding marketing strategies by several influencing
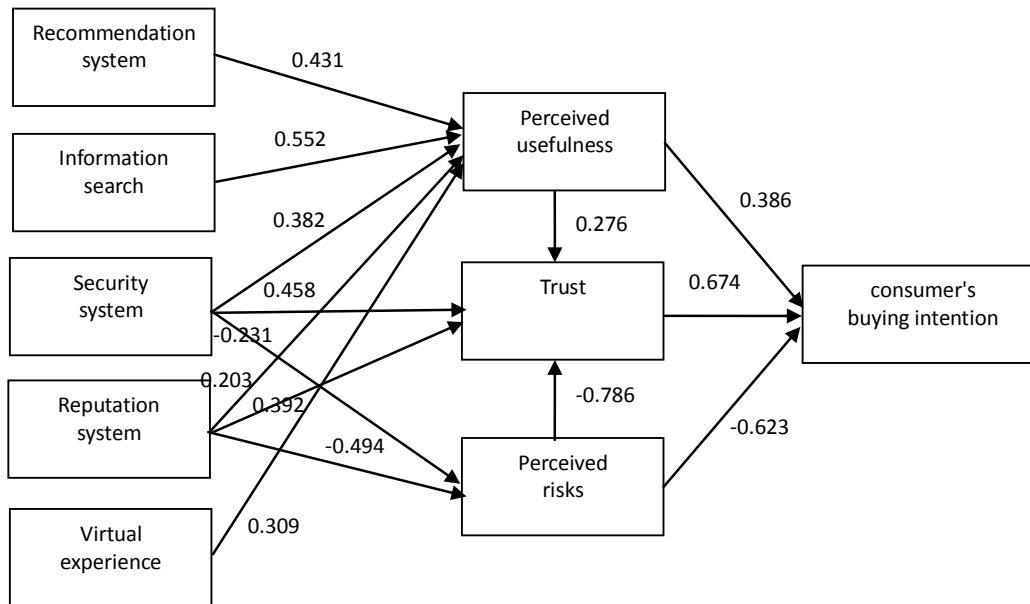
Figure 2. Path diagram of LISREL model.

factors above.

Conclusion

The paper uses the TAM to empirically analyze the decision making influences of recommendation system, information search, reputation system, virtual experience and security system on consumers of C2C e-commerce in big data environment. After making the optimization and improvement for several influencing factors above, the paper attempts to propose five main paths to provide consumers with better shopping experience, and provide more excellent marketing strategies for e-commerce enterprises.

The first path is to construct excellent recommendation system based on the big data. From the empirical results, we determined that there are three suggestions. The first one is to strengthen the strategic cognition of recommendation system, promote the decision making process of buyers and sellers. In this paper, hypotheses 1 and 18 show that excellent recommendation system will have a profound impact on the decision making in purchasing of consumers in the era of big data. Moreover, the impact will be fully reflected in the final selection, the quality of decision making and other aspects. First, recommendation system can save a lot of time of information search, evaluation and selection; it makes consumers to locate and match their preferences and points of interest easily. For example, the usage of recommendation system can expand the range of commodity search and evaluation,

so that consumers have a greater choice of goods, thereby enhancing the consumer's buying intention and desires. Furthermore, the extensive application of recommendation system will undoubtedly have certain impact on the decision making of buyers and sellers. From the perspective of consumers, consumers want to use recommendation system to improve their decision making in purchasing, thus purchasing the products of meeting their own preferences and needs with more reasonable and acceptable price (Zhao, 2012). From the perspective of interest groups, they want consumers to accept the recommendation of recommendation system in the largest extent in order to accelerate the process of decision making in purchasing, thus achieving or exceeding the sales target in the specified region. Therefore, constructing the excellent recommendation system has become an urgent need in the era of big data. The second one is to enhance the reliability of the recommended service, improve the consumer evaluation and acceptance of recommendation system. Product recommendation system recommends more reliable information; the easier it is to generate consumer's confidence, accompanied by a feeling of pleasure and motivation (Li, 2009). In order to effectively enhance consumer's acceptance of the recommendation information, to attract more potential customers to make a decision within a shorter time to buy the commodity businesses, online merchants must find ways to increase consumer's acceptance with the help of the product recommendation system which allows consumers to fully understand the product recommendation system is

dedicated to provide services to them. Consumers' perception of the recommendation system will not only help them to greatly reduce the time and effort required for product information search, evaluation and screening, but also it can help them to buy more in line with their own needs and preferences of goods at more reasonable price. Businesses can illustrate product's reliability by the rankings based on sales rank and reputation. It can also be described by influential opinion leaders' or experts' related fields experience to recommend the use of such actual similar cases and data can significantly enhance consumer's confidence on commodity recommendation system. The third one is to feature a well-designed recommendation system itself and optimize personalized service. In the era of big data, to let each consumer be able to experience "one to one" personalized shopping services to the maximum extent, shopping sites can track real-time changes in consumer demand through various channels, to find consumer's demand preferences and points of interest, to recommend consumers product which meets their needs, so that the recommended products' prices, features, quantity, size, brand, style and other attributes can best meet the selection criteria and preferences of consumers, which will improve consumer's acceptance and satisfaction of goods recommendation system (Wu, 2013).Through the development of new technologies, websites can also be automated access to information through the context of contextual information, which is synthesis to extend the scope of the collection of contextual information, and to determine changes in consumer demand for goods based on changes in a particular context, in order to improve reliability and accuracy of personalized product of personalized e-commerce platform commodity recommendation, to improve recommendations adaptability, to achieve better personalized merchandise recommendation service.

The second path is to establish a sound reputation system based on big data. From the empirical results, we determined that there are two suggestions. The first one is to enhance the certification authority of the third party and establish the trust mechanism. The highlighted significance of hypothesis 19 indicates that trust has a significant impact on consumer behavior in decision-making which is not to be underestimated. So, good work of third-party certification is bound to reduce consumers' concerns about online transaction security, enhancing consumer's confidence index. We need to increase efforts to introduce well-known certification body throughout the industry, to strengthen the construction of third party certifications' authority; but we also need to step up publicity efforts on third parties, and to spread related organization information on third party, allowing consumers to learn what they can do and the role they play. Eliminating consumer's misunderstanding of these third-party in a gradual way will increase consumer's recognition of third party establishing trust between

consumers and third parties (Nie, 2013). Furthermore, the trust is transferred to buyers and sellers through a third party, and thus can contribute to lower consumer trust established C2C mode. At the same time, government agencies should also establish consumer confidence through the development and improvement of laws and regulations under the C2C e-commerce model, increase security of online transactions through technical means, of reducing speculation of businesses to enhance consumer's C2C confidence of electronic Business. For the public, in order to focus on improving the social and moral level, we need to create faith-based moral values to strengthen the integrity of the concept of public education, which is particularly important for the current situation of low trust. The second one is to enhance the quality of the platform site, reduce the perceived risk of consumers. From the point of view of this study's empirical results, the highlighted significance of hypo-theses 17 and 20 have fully illustrated that the perceived risks associated with consumers' confidence and willingness to buy is important in consumer's buying behavior in the decision-making process. Therefore, businesses and interest groups can start in improving system's assessment evaluation, improving the quality of the site to meet consumer's trust and better expectations. In addition to doing their own web site quality assurance work, they should also vigorously promote the main-tenance of the website for consumers, such as "payment system", a third-party guarantee, etc, to create an atmosphere of trust. To some extent, this will reduce consumer's perceived risk, enhancing consumer's confidence. In addition, in order to get more consumer's confidence, they can use traditional media to advertise, thereby enhancing awareness in consumers, and promoting the consumer's trust with high visibility.

The third path is to optimize and popularize the function of virtual experience. From the empirical results, we determined that there are three suggestions. The first one is to optimize the virtual experience of products, enhance the full display of products. Optimizing the virtual experience of products mainly breaks through the traditional model of products presentation like text and picture, optimizing the consumer awareness of products by the experience of virtual products, and further builds the confidence of purchasing. In the level of virtual products presentation, some relatively complex products like digital products and cars apply it more. They use the technologies like 3D products presentation and interactive animation to make consumers understand the overall details of the products through the network platform. The second one is to build up the management mechanism of virtual experience based on the technology of big data. In the level of virtual experience of products, virtual experience online makes consumer's awareness that products bring the satisfaction of their own needs for consumers get further promotion. Hypotheses 14 and 15

are rejected. The reason may be that consumer awareness of the virtual experience is very vague and they just know that it can help them better choose products. Because online shopping cannot be experienced personally, how to buy the products of meeting and suiting their own needs by online shopping has become an important factor affecting the satisfaction of online shopping. Therefore, the function of virtual experience of products is to make consumers understand the style and match of products by virtual usage, so as to choose more in line with their own needs. The third one is to make plans with the help of big data, enhance the virtual experience. Not only is big data able to find the short-board of user experience, but also big data itself bears the solutions to enhance the user experience. Because the big data has a diverse nature and rich source, it lays a foundation to solve the following problems (Kang and Liu, 2013): (1) discover the bottlenecks timely in the trading process with the help of big data; (2) achieve the larger trading volume with the help of big data; (3) optimize the information recommendation and reduce the consumer cost perception of virtual experience with the help of big data.

The fourth path is to improve the function of information search. From the empirical results, we determined that there are two suggestions. The first one is to integrate the search and marketing and reduce the perceived cost of consumers. With the popularity of the Internet and the development of e-commerce, the phenomenon of information overloading and complexity of choice will be more and more common. What is more, it will affect the consumer's buying intention. Therefore, enterprises of the e-commerce platform should display the commodity in the most acceptable and understandable manner by consumers for reducing their cognitive costs. At the same time, enterprises should improve the matching degree of shopping-oriented search and provide personalized products recommendation for reducing the searching costs. In order to help consumers relieve the pressure of information overloading, firstly, enterprises can adopt the products recommendation agent (RA) whose development is more mature to provide more comprehensive, adequate and personalized information for consumers in the phase of consumer information retrieval. The purpose is to make the consumer's evaluation for the products features, performance and price reasonableness more in-depth and accurate, thereby reducing cognitive deviation of different brands of products. Secondly, for the recommended products, RA often provides the information like expert comments and consumer reviews for consumers (Cheng and Cai, 2009). Hypothesis 3 is rejected; the reason may be that recommendation system simply pushes based on the previous goods searching information and shopping information, and does not have much impact on consumer privacy. Therefore, it does not have obvious relative relationship between them. The

second one is to introduce the technology of cloud computing, strengthen the service of information retrieval and reduce the perceived cost of consumers. For the perceived ease of use and perceived low cost of shopping sites, the emotional experience of consumers is more important in the process of information search. Hypothesis 5 is rejected, one of the possible reasons is that the number of consumers accepting the information will affect the pleasure in the process of shopping, and there is no direct impact on consumer trust. Therefore, the hypothesis is not significant. Hypothesis 6 is rejected; the possible reason is that in the middle of information search and perceived risk has two or even more than two variables as an intermediary, so that the relationship between them is not significant. In the specific cultural environment of China, people are more inclined to trust the more familiar enterprises. When consumers are no stranger to the shopping site and acquainted with it after interacting, it may build up consumer trust. Large-scale computing power provided by cloud platform architecture and processing capabilities of big data can provide the powerful function of personalized information retrieval. In addition, these abilities can bring about the new services of information retrieval, such as the service of information push, hot information push and information recommendation (Huang, 2012). The technical advantages of cloud computing enable the information retrieval and services to solve the long-standing problems of the comprehension of human natural language and knowledge reasoning, giving full play to the functions of data mining deeply and knowledge discovery. The purpose is to analyze and handle the behavior of the user information quickly and accurately, understand the expression of users' natural language and carry on the corresponding intelligent retrieval. Finally, the information and products meet the needs of users, thus improving the speed and accuracy of the service for users and promoting the satisfaction of consumers maximally (Yu, 2010).

The fifth path is to construct a stable security system in the era of big data. From the empirical results, we determined that there are two suggestions. The first one is to reduce information asymmetry and enhance customer security. Online payment has many characteristics, such as virtuality and Macross. Both transactions conduct online payment in a virtual environment of big data, and the two sides are difficult to evaluate objectively for authenticity and accuracy of the other party's information. In this case, the occurrence of the information asymmetry has certain inevitability. Therefore, the information asymmetry is the biggest obstacle to online payment and settlement. Applying big data in e-commerce, especially in C2C e-commerce cannot only reduce the risk of trust arising by information asymmetry, but also make consumers experience virtual shopping, thereby affecting the model of consumer shopping behavior. Under this scenario, big data becomes the new hot spot in the field

of e-commerce information in cloud computing and networking. The second one is to improve security system and increase customer loyalty. E-commerce based on big data as a new business model has great development prospects. Meanwhile, the e-commerce model puts forward higher requirements on management and information transferring technologies. The construction of security system is particularly important. How to build a safe and convenient environment of e-commerce applications and provide adequate protection for information are the concerned topic by businesses and users. In security system of data and application, it mainly considers that application system can seamlessly connect with the security service of the system layer and network layer, services for the software that are constructed in the operating system. In security management system, from the perspective of user management, enterprises should achieve unified partitioning strategies of user roles; from the perspective of resources management, enterprises should achieve distributed configuration of resources and unified management of resource directory; from the perspective of dual technology management, enterprises should achieve unified safety supervision in the light of all layers of requirements to provide the basis for IT decisions. In security system of network information, through the unified platform of security management, enterprises should provide comprehensive content of security service and form a mutual cooperative unity. The entire system covers all levels of security requirements from physical communications to network, the platform of system and the platform of data and application, thus forming a complete architecture of information security system.

Conflict of Interests

The authors have not declared any conflict of interests.

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Appendix. The questionnaire of this study.

Variable	Items
Security system	SC1: When shopping online, I am worried about the low safety of the site and the risk
	SC2: When shopping online, I am worried about a lot of uncertain security problem of payment and abandon the purchase
	SC3: When shopping online, safety is an important basis for our reference and choice of shopping website
	SC4: High safety of shopping website can let me feel at ease and satisfaction in shopping
	SC5: When shopping online, I will choose the high safety of shopping website
	SC6: I believe that the shopping website won't put my personal information out
Recommendation system	RS1: Shopping website recommendation of goods is what I need
	RS2: Shopping website recommendation of goods is that I have not purchased but want to buy
	RS3: I believe that the recommendation information is an act of kindness
	RS4: I believe that the recommendation of goods will not intentionally provide false information
	RS5: I doubt that recommended shopping website is how to get my personal information
	RS6: I'm worried about recommended shopping website will sell my personal information to others
Reputation system	RP1: When shopping online, I only choose the business who have good reputation and high evaluation
	RP2: When shopping online, the reputation of shopping website has a certain influence for my choice of shopping
	RP3: When shopping online, I will refer to the netizen's comments and opinions in this website
	RP4: I think business reputation and the risk of buying goods have an inverse relationship
	RP5: If the shopping website reputation is low, I will not buy goods in the website
	RP6: When shopping online, I usually compare different businesses reputation to make my choice
Information search	IS1: I can always search the useful information in the shopping website
	IS2: The information I search in the shopping site are detailed and completed
	IS3: I trust this shopping website because of the powerful search function
	IS4: Search results provided by shopping website is very real
	IS5: Considering the unsafe search information, I will give up to shopping in the website
	IS6: If the shopping website provides false results, I will give up to shopping in the website
Virtual experience	VE1: I prefer to choose the shopping site which provides virtual experience
	VE2: I'm very satisfied with shopping in the website which provides virtual experience
	VE3: The shopping website which provides virtual experience can let me choose more suitable goods
	VE4: Function of virtual experience is one of the most important factors that we choose the shopping website
	VE5: If the virtual experience reveals my privacy, I will give up this function
	VE6: If it has no related security measures, I won't use this function of virtual experience
Perceived usefulness	PU1: Online shopping can save time and money
	PU2: When I use the shopping website, I can feel fun and enjoy my time
	PU3: In a word, online shopping is very useful to me
Perceived risk	PR1: As soon as I see the problems of user reviews on the shopping website, I will never buy anything on the site
	PR2: The reason why I choose this shopping website is that I think it has low shopping risk
	PR3: I worry about the virus or hacker to steal my account information when shopping online
	PR4: I will feel the risk when shopping online

CONT   Appendix. The questionnaire of this study.

Trust	TR1: I think trading by this website is reliable
	TR2: The recognition and trust to the suppliers of the online shopping service will affect the adoption of the shopping website
	TR3: I will be at ease when I use the site for shopping
Purchase willingness	PW1: I will use the site for shopping as soon as possible
	PW2: I will share the experiences of using the site with my friends
	PW3: I will use the site of e- commerce for shopping frequently in the future

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