

The Privacy Concerns' Influences on Bike-Sharing Consumers' Behavior

Jun Cui¹ and Chae-Kwan Lim²

¹Department of Business Administration, Tongmyong University, South Korea

²Department of Distribution Management, Tongmyong University, South Korea

cklim@tu.ac.kr

Abstract. With the booming development of Internet technology, the sharing economy model has emerged. Under the sharing economy, the sharing of resources has created more wealth, especially shared transportation, in which Shared Bicycle has been favored by consumers as their first choice to travel short distances. However, with the rapid development of Shared Bicycle, problems in sharing economy have risen. First, sharing bikes charge on the applications and track personal trips, causing users to worry about personal privacy leakage and threatened account security. Second, many damaged shared bikes that could not be promptly repaired causes a poor user experience and even pose a threat to users' travel safety, thus affecting their degree of satisfaction and subsequent using behaviors, which challenges the development of Shared Bicycle. This paper built a relationship model of privacy focusing on consumer behavior with China's "shared bikes" as the service platform in the context of the mobile internet. After data was collected from consumers, SPSS and AMOS statistical software were applied to examine the effective questionnaire information, concluding that consumer privacy concerns negatively affect consumer behavior and negatively affect consumer experience satisfaction. Furthermore, the mediating role of experience satisfaction was verified during this process and a reference for the protection of information privacy of service platform consumers was provided in the context of mobile Internet.

Keywords: Bike-sharing, privacy concerns, consumer experience satisfaction, consumer behavior

1. Introduction

High economic growth has contributed to a shortage of economic overcapacity. Meanwhile, with the continuous application of big data, cloud computing, and the IoT, the sharing economy is booming and is transforming traditional industries. According to the 48th Statistical Report on Internet Development in China released by CNNIC (China Internet Network Information Center), the number of Internet users in China reached 1.01 billion by June 2021, an increase of 21.75 million compared with December 2020, and the Internet penetration rate reached 71.6% (CNNIC 2021). The extensive use of mobile Internet and LBS technology allow resource providers to accurately and timely distribution of product or service information, and consumers could obtain the location, price, and other information of the product service through the mobile terminal anytime and anywhere, thus reducing the cost of information search and finally reaching a deal by online and offline communication with the platform or individual resource providers.

In the travel market, the rapid development of shared bicycles has made it synonymous with the sharing economy. Bicycle-sharing platform companies have entered the market with a dockless bicycle model. Solving the needs of users for short-distance travel, short-distance connection complements medium, and long-distance travel plays an essential role in alleviating current traffic pressure. By the second quarter of 2020, accumulative mobile map users have reached 893 million (iiMedia Research, 2020). Mobile maps like Auto Navi Map, Baidu Maps, and Tencent Maps have launched more integrated LBS solutions integrating "tools + data + services", hence users are not unfamiliar with positioning cars with mobile phone clients.

In addition, as WeChat, Alipay, Didi, and other applications open mobile payment functions, QR code scanning has served as an essential entrance to mobile payment. Therefore, users could better accept QR code scanning and mobile payment. Since 2016, the number of shared bicycle users has been on the rise. In 2020, the number of users affected by the epidemic declined but still reached 253 million. According to data from iiMedia Research, there are five main usage scenarios for bike-sharing users, among which daily short-distance travel ranks first, followed by outings. Social activities and exercises are also one of the usage scenarios for bike-sharing users. Cycling is suitable for commuting to work or going to school (iiMedia Research, 2020). Nowadays, each bicycle rental platform adopts the method of "real-name authentication, mobile phone binding deposit", and the information is collected when the user registers. User information mainly includes the user's personal identity information, geographic location information, and personal account information.

Most sharing economy platforms pay more attention to tackling the trust problem of consumers' privacy concerns from the perspective of system and technology but neglect how to enhance their trust in the platform from the consumer experience process and the characteristics of the consumer groups. Therefore, considering these

aspects, this paper takes bike-sharing as the starting point to study the effects of privacy attention and experience satisfaction on consumer behavior. Improve participant experience satisfaction by protecting personal privacy information, thereby expanding the scale of consumer groups of participants.

2. Literature Review

2.1. Privacy Concerns

The concept of "privacy concern" was proposed by sociologist Westin in 1967, who believed that it refers to the degree of fairness that individuals feel subjectively in the corresponding privacy situation (Westin 1967). Smith et al. believed that privacy concerns are "individuals' concerns about how the organization collects and uses personal information" (Smith et al., 1996). Phelps et al. divided privacy concerns into three categories by the plot and believed that privacy concerns can be described as consumers' concerns about controlling, collecting, and using their personal information (Phelps et al., 2001). Hsu gave a more comprehensive definition that privacy issues are people's perception of specific privacy risks, attributes, and protection (Hsu 2003). (Bansal et al., 2010) believed that privacy concerns refer to consumers' concern about uncertainty or risk caused by illegal collection or use of personal or credit information. consumers' concerns about unknowable risks caused by illegal collection or use of personal information. Hong et al. classified privacy concerns into three major issues: control, cognition, and collection (Hong et al., 2013).

Some scholars also explain privacy concerns from different perspectives. Dinev and Hart believed that Internet privacy concerns refer to individuals' perceptions of the risks that might be brought about by the information they provide to the Internet (Dinev et al., 2006). Castaneda pointed out that privacy concerns are people's concerns about the infringement and unreasonable use of basic personal information during online shopping (Castaneda et al., 2009). Jiang Xiao and Ji Shaobo regarded consumer privacy issues as consumer concerns to what extent do e-commerce platforms collect, control and apply their personal information (Jiang et al., 2009).

Given the above research, the definition of privacy concerns could not be unified under different backgrounds and from different perspectives. This study attempts to define consumers' privacy concerns as the degree of consumers' attention to information control, collection, and use.

2.2. Experience Satisfaction

The consumer satisfaction that people usually refer to consists of two parts, i.e. consumer decision satisfaction and consumer experience satisfaction. The former is generated by consumers' experience of purchase decision-making during the shopping process while the latter mainly refers to consumers' evaluation and feelings of the final purchase result. Decision-making satisfaction has a far more significant impact on overall consumer satisfaction compared with the experience satisfaction

brought by the end of the product purchase process. Some scholars have also found that although experience satisfaction is of little significance to the purchase of a certain brand, it substantially affects the e-commerce platform. Meanwhile, when and why consumers delay purchasing, the shopping experience on e-commerce platforms will affect consumer experience satisfaction (Fitzsimons 2000).

By combing previous studies, the author found that some literature examined factors that influence consumer experience satisfaction. The prevailing view is still from Penn's 1992 paper, arguing that task, situational, and personal consumer factors are the three major factors that affect consumer purchasing decisions.

In terms of the impact on consumer experience satisfaction, this paper summarizes the previous literature and mainly divides the factors affecting consumer experience satisfaction into sufficient quantity, purchase information (the price, service, and quality information obtained by consumers before making the decision, which is conducive to the purchase decision), shopping experience, product evaluation, satisfaction after purchase, and sufficient shopping time.

2.3. Consumer Behavior

(Engel et al., 1993) have supplemented the definition of consumer behavior, believing that is a variety of means for consumers to acquire, use, and dispose of goods or services. (Nicosia et al., 1996) believed that it is a purchasing behavior, not for resale. (Schiffman et al., 1991) believed that consumer behavior is not only purchasing behavior but also includes seeking and evaluating products or service. (Solomon 1998) no longer confined consumer behavior to individuals but considered team behaviors, believing that is a series of processes during which consumers taken, consume, and dispose of products, experiences, services, and plans to satisfy their needs and desires. (Yu 2015) proposed that consumer purchase behavior is based on the demand incentive model. Kotler et al. believed that consumer purchase behavior should include the following five stages, i.e. confirmation needs, information retrieval, evaluation planning, purchasing decision making, and post-purchase behavior (Schipani 2019). From the above point of view, consumer behavior can be seen as a process, including all activities related to purchase and use decisions.

The aims of this study is to investigate the effect of privacy concerns on consumer behavior in the context of sharing platforms, hence this paper defines consumer behavior as determining needs, searching for relevant information, evaluating purchase plans, and making purchase decisions, post-purchase evaluation, and other behaviors.

3. Research Model and Hypotheses

3.1. Research Model

Observed from domestic and foreign research on how privacy attention acts on consumer behavior, privacy attention could not only directly affect consumer

behavior but also influence it through the variable of experience satisfaction. As suggested by (Smith et al., 1996), a theoretical model of the relationship between privacy concerns and shared platform consumer behavior in the context of big data was constructed, as shown in Figure 1.

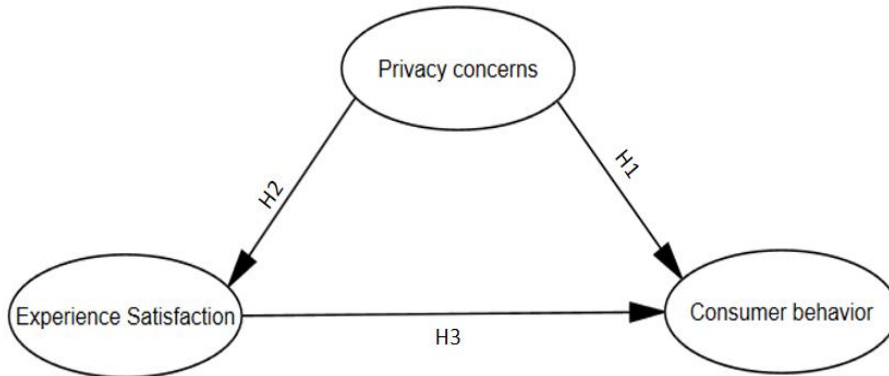


Fig. 1: Research model

3.2. Research Hypothesis

Given the previous studies, this research proposes the following hypotheses:

H1: Privacy concerns will negatively affect the behavior of consumers on sharing platforms.

H2: Privacy concerns could negatively affect experience satisfaction.

H3: Experience satisfaction could positively affect consumers' behavior.

H4: Consumer experience satisfaction acts as a significant intermediary role between privacy concerns and consumer behavior.

4. Empirical Analysis and Results

4.1. Survey Design

This study obtained the original data of the study mainly in the form of a questionnaire survey. The respondents are distributed across the country, covering many Chinese provinces and cities. Afterward, the validity of the questionnaire was checked and the invalid questionnaire was deleted. The final distribution of 240 questionnaires and 223 valid questionnaires were recovered from the two channels, with an efficiency of 92.9%.

In the questionnaire applied in this study, 10 items of privacy concerns in Hong et al (2013) were set from control, awareness, and collection (Hong et al., 2013). Experience satisfaction was set from the product, price, service, and convenience and 8 items of consumer behavior were set from the way of transmission, code of conduct, and frequency of use, which were measured by the 5-level Likert scale.

SPSS26.0 software was adopted for descriptive statistical analysis, exploratory factor analysis, reliability and validity tests while AMOS26.0 software was applied to test the hypotheses. In addition, the mediation effect was tested through the bootstrap method.

4.2. General Characteristics of Data

The demographic characteristics of the sample are shown in Table 1.

Table 1: Characteristics of samples

Sortation		Frequency	Ratio (%)
Gender	Male	161	69.1
	Female	72	30.9
Age	25s	67	28.8
	26-35	111	47.6
	36-46	47	20.2
	46s and older	8	3.4
Academic background	College degree and below	32	13.7
	Undergraduate	176	75.5
	Undergraduate	23	9.9
	PhD	2	.9
Profession	Student	38	16.3
	Office staff	89	38.2
	Free-lancer	49	21.0
	Professional occupation	35	15.0
	Public officer	22	9.5
Monthly average income	3000 yuan less than	1	0.4
	3,000-6,000 yuan less than	3	1.3
	6,000-10,000 yuan less than	106	45.5
	10,000 yuan and more	123	52.8
Total respondents		233	100.0

In Table 1, from the perspective of gender distribution, male samples account for 69.1% while female samples for 30.9%. In terms of age, "26-35 years" occupy a relatively large proportion of 47.6%. In terms of education level, there were many "bachelor" samples with a proportion of 75.5%. In terms of profession, "professionals" account for more than 30%. 52.8% of the respondents chose "over 10,000 yuan". There were also 45.5% of the samples whose income ranges between 6,000 yuan and 10,000 yuan.

4.3. Reliability and Validity of Measurement Variables

The results of reliability and validity of measurement variables are presented in Table 2.

Table 2. Results of reliability and validity test

Theoretical variable	Factor	Item	Factor loading	Cronbach α	Eigen value	Var. (%)	KMO measurement
Privacy concerns	Control	Have the right to control how my information is collected, used, and shared	.831	.751	3.893	38.930	KMO=0.765 X ² =894.125 df=45 p=0.000
		The importance of controlling my information	.884				
		If I can't or do not completely control my personal information, I feel my privacy violated	.641				
	Awareness	Bike-sharing companies should collect my personal information in the way the information is collected, processed, and used	.853	.817	1.663	16.630	
		The privacy terms of bike-sharing companies should have a clear statement of the collection and use of my personal information	.883				
		I need to know how my personal information is used	.773				
	Collection	I was upset when bike-sharing companies needed all kinds of my personal information	.758	.807	1.345	13.450	
		When bike-sharing companies need my	.761				

		personal information, I should consider it first					
		Providing my personal information to many different bike-sharing companies has worried me	.837				
		I worry that bike-sharing companies collect too much of my personal information	.686				
Experience satisfaction	Product experience	Vehicle appearance	.798	.919	7.218	55.520	KMO=0.892 X ² =2419.477 df=78 p=0.000
		Unlock way	.771				
		The vehicle is comfortable	.898				
		Safety	.776				
	Price experience	Deposit standard	.807	.900	1.315	10.120	
		Preferential strength	.794				
		Single expense	.909				
	Service experience	Customer service response	.807	.902	1.172	9.020	
		Find a vehicle	.806				
		Vehicle maintenance	.868				
Convenient experience	The deposit is returned	.765	.883	1.100	8.460		
	APP makes use of	.744					
	Vehicle use	.902					
Consumer behavior	Route of transmission	I will send others positive messages about shared bikes	.901	.842	4.063	50.790	
		I will give feedback and suggestions to the operating platform to improve the bike-sharing use experience	.912				
	Code of conduct	If I use shared bikes, I will keep them as good, clean, and intact as possible	.794	.880	1.455	18.190	

		I will help others who have trouble using shared bikes	.851				
		What I do could make it easier for bike-sharing operators	.913				
	Operating frequency	I am highly likely to use shared bikes in the future	.841	.889	1.144	14.300	
		I will consider participating in bike-sharing consumption activities	.870				
		I will give priority to using shared bikes without other factors	.908				

After processing the data collected by the questionnaire, the results show that the overall Cronbach's Alpha system value is above .7, and the corresponding values of the 10 dimensions exceed .7, this implies that there is a high internal consistency in the questionnaire, this survey have excellent reliability.

To identify the correlation between each item and the whole, the correlation coefficient of the total score is less than .3. Based on the credit test, the correlation between the total score in the questionnaire exceeds .3. It indicates that most of the items are related to the whole, which is distinctive.

Through the comprehensive analysis of KMO value, variance explanation rate value and factor loading system value, the validity level of data is verified. As observed from Table 2, all research items have a common value higher than .4, implying that all the extracted items are valid. In addition, a KMO value greater than .7 indicates that the data is valid.

According to the meaning of the scale title and the rotation component matrix, the load value more than .5 could be used as a prerequisite for analysis. The test results indicate that the load value of each scale is more than .5 and the calculation results of the rotation component matrix accord with the scale and size divided in this study. As a result, the questionnaire efficiency value is high and the questionnaire is valid.

4.4. Confirmatory Factor Analysis

The results of the confirmation factor analysis are shown in Table 3 below.

Table 3. Results of confirmatory factor analysis

Concept variable	Measured item	Standard loading	Standard Error	t value	CR	AVE
Privacy concerns	Control	.716	-	-0	.921	.542
		.788	.137	8.827		
		.646	.117	8.136		
	Awareness	.815	-	-		
		.783	.102	11.104		
		.737	.086	10.662		
	Collection	.779	-	-		
		.598	.080	8.518		
		.714	.093	10.168		
		.756	.098	10.701		
Experience satisfaction	Product experience	.884	-	-	.970	.748
		.840	.056	17.110		
		.884	.057	18.833		
		.838	.054	17.005		
	Price experience	.841	-	-		
		.875	.064	16.294		
		.886	.070	16.555		
	Service experience	.895	-	-		
		.871	.051	17.954		
		.846	.062	17.106		
	Convenient experience	.852	-	-		
		.852	.067	15.386		
		.832	.070	14.924		
Consumer behavior	Way for spreading	.878	-	-	.955	.728
		.835	.110	9.802		
	Code of Conduct	.813	-	-		
		.853	.073	14.386		
		.871	.081	14.662		
	Usage frequency	.844	-	-		
		.839	.064	15.190		
		.891	.076	16.269		
$\chi^2 = 710.681$ (d.f.=389, p=0.000), $\chi^2 / d.f. = 1.827$, RMR=.046, GFI=.930, AGFI=.808, NFI=.859, CFI=.930, RMSEA=.060						

In this paper, Reliability Combination (CR) values and mean Extraction Variance (AVE) values were applied as evaluation criteria for convergence validity, which is generally considered to be better he CR value and AVE value of the factors are greater

than .7 and .5. The basic AVE values of each dimension are greater than .5 and its CR values are greater than .7, implying that the convergence validity of this dimension is high.

According to Table 3, in the research model, Appropriate indicators of various models meet the standard, hence the model adaptation degree is very high.

4.5. Correlation Analysis

The results of correlation analysis are presented in Table 4.

Table 4: Result of correlation analysis

Sortation	Privacy concerns	Experience Satisfaction	Consumer behavior
Privacy concerns	.736		
Experience Satisfaction	-.321**	.865	
Consumer behavior	-.476**	.590**	.853

The diagonal value represents the square root the average variance index (AVE)

** $p < .05$

Discriminatory validity is measured by using the square root of AVE and comparing it with the correlation coefficient of three factors. If the square root value of AVE is greater than "the correlation coefficient between this factor and other factors", it shows that it has good discrimination validity. According to the discrimination efficiency table, the arithmetic square root of AVE is greater than the absolute value of correlation coefficient between potential variables. The results show that Potential variables have a certain correlation with each other, and there are differences between them. The discriminative validity of the data in the scale is acceptable.

4.6. Results of Research Hypotheses Verification

Privacy concerns have significant negative effects on consumer behavior, i.e. ($b = -.463, P < .05$), thus supporting path 1; privacy concerns have significant negative effects on experience satisfaction, i.e. ($b = -.420, P < .05$), thus supporting path 2; experience satisfaction has a significant positive impact on consumer behavior, i.e. ($b = .588, P < .05$).

Table 5. Results of the hypotheses test

Hypothesis	Path	Non-Std. coefficient t	Std. coefficient	S.E.	t	P	Adoption status
H1	Privacy concerns → Consumer behavior	-.329	-.463	.083	-3.988	***	Adoption

H2	Privacy concerns → Experience satisfaction		-.504	-.420	.119	-4.234	***	Adoption
H3	Experience satisfaction → Consumer behavior		.349	.588	.065	5.354	***	Adoption

By analyzing the mediation paths of the model, the indirect effect bias correction confidence interval and test significance are shown in Table 5. The deviation correction value of the privacy-based consumer behavior based on experience satisfaction is CI [-.456, -.128] and the significance P-value is less than .05, implying a significant indirect effect of the path and a mediation effect.

Table 6: Mesomeric test

Path	Metavariables	Indigo effect		
		Boot CI lower	Boot CI upper	p
Privacy concerns → Experience satisfaction → Consumer behavior	Experience satisfaction	-.456	-.128	.002

Table 7: The proportion of intermediary effects

Path	Effect	Effect value	Relative effect values
Privacy concerns → experience satisfaction → consumer behavior	Total effect	-.710	
	Direct effect	-.463	65.21%
	Mesomeric effect	-.247	34.79%

According to the decomposition table of the total effect, direct effect, and intermediary effect, the relative effect value of the direct effect is 65.21% and that of the intermediary effect is 34.79% in the path of "privacy concerns → experience satisfaction → consumer behavior", implying that privacy attention could not only directly predict consumer behavior but also indirectly predict it through the intermediary effect of experience satisfaction.

5. Conclusions

From the empirical research results of this paper, the following conclusions could be drawn. First, consumer privacy attention is negatively correlated with consumer

behavior. Through the application of personalized recommendation technology, the sharing platform hopes to make the recommendation more in line with the needs of consumers to increase the probability of success of the recommendation. Once privacy focuses on "crossing the line", consumers might be rebellious and reluctant to use the platform's shared bikes again. Second, privacy concerns will negatively affect consumers' experience satisfaction. In face of personalized accurate recommendations, consumers for high privacy attention tend not to first feel their demand satisfied but uncomfortable and alert of the source of the recommendations because they find that their inadvertently shared information on a platform is easily obtained by a third party. Hence, it is natural for them to wonder whether their other more private information in addition to such information, especially information related to online payment cards, has been used by bike-sharing platforms (Oppermann et al., 2018). In this case, the rich and unique consumption boost brought by personalized recommendation will not become a pleasant technology but will bring heavy psychological pressure and burden to consumers, thus making it difficult for them to obtain good experience satisfaction during the process of use. Third, experience satisfaction has a positive correlation to consumer behavior. Whether shared bikes are applied and how to use them is closely related to the consumer experience. For example, with tangible product level services to improve the consumer enthusiasm of consumers, to carry out all kinds of consumer security services as an experiential marketing strategy, and strive to improve consumer satisfaction. In addition, consumer experience satisfaction presents an intermediary role between privacy attention and consumer behavior, i.e. that the higher consumer experience satisfaction, consumers could ignore their privacy concerns to try out the brand's shared bikes. Compared with consumers with low experience satisfaction, the weaker the negative impact of consumer privacy attention on consumer behavior.

The rise of online ride-hailing is not long enough and the data is too redundant, hence the timeliness of the first-hand data obtained through various websites is not high enough to a certain extent. Due to their reasons, the knowledge and theoretical application ability are insufficient, which makes the depth of the research content of this paper insufficient. In future studies and research, the author will continue to pay attention to the development trend of the shared transportation industry and strive to provide more valuable research results for the progress of the shared transportation industry.

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