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AMOS Based Analysis of User Satisfaction of Bike Sharing Services

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Abstract

The first non-docking sharing-bike program of the world appeared in China at the beginning of 2016 with the increasing popularity of mobile payment, GPS and other technology innovations. As the competition among sharing-bike sector is getting fierce, the strategies adopted by companies to battle for market share are limited to costly money burning schemes, i.e., to provide more bikes and offer less service charges. This study aims to explore an operationalizable business model on the basis that the operating profit for bike-sharing companies is only sustainable with increasing customer satisfaction. Data were collected from 346 sharing bike users using online questionnaire website. Three prominent factors, namely, safety and green transport, flexibility and convenience, and service and maintenance are shown to significantly contribute to user satisfaction. Facilitated with AMOS, a structural equation model (SEM) was developed to quantify the explaining powers of the identified factors as well as the overall model. A business strategy founded on such results may grant more likelihood of financial success, and is recommended to the industry.

JEL classification numbers: M21, O14, Q01, Q56
Keywords: Bike sharing, Sharing economy, User satisfaction, Green transport, Structural equation, AMOS

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1. Introduction

Due to rapid economic growth in China, using green public transportations hence became a natural choice for societal as well as economic benefits in the long run (Zhang et al, 2016). The first example representing such social-economic innovation goes back to a public bike sharing program (PBSP) in the 1960s in Amsterdam, introduced as part of the solution to environmental problems and short distance trip (Wang et al, 2009). In this first generation of PBSP where white-painted bikes were put on/beside roads, people could ride these free-floating bikes to make their own routes, and leave them for next user (Paul, 2009). However, theft and vandalism posed serious problems to this scheme because the usage and routes of these bikes could not be tracked (Yang and Huang, 2017). As a result, the growth of PBSP was slow. The 3rd generation PBSP employing smart card technology, Velo'v, was launched in London in 2005 (Karki and Liu, 2016). PBSP has been optimized continuously since then. In this new scheme, people register by paying deposit and then acquire a card to use the bicycle. Public sharing bikes are all parked in docking stations, in which bikes are available when the registered users use their e-cards. They could return bikes to stations using the same approach and the fee would be charged automatically from the card (Wang et al, 2009). This program has exerted an immense influence on the widespread expansion of PBSP around the world. With the improvement of operations and technologies on tracking bikes and uses, from 2014, PBSP is now in operation all around the world and about 220 cities in China (Li et al, 2019). PBSP not only is a possible solution for the "last mile" problem costing less money and offering more mobility, but also efficiently connects with other means of transport to reduce the travel time and lessen the environmental impacts from motor vehicles (Boyd and Jan, 2014).

China has been developing the 3rd generation PBSP in recent years because of its social and economic advantages, particularly in lessening the air pollution and traffic jam problems from motorized vehicles (Lan et at, 2017). It was in 2005 that Chinese PBSP was initiated by private companies to fulfill the demand of tourists for cycling trip. Now, modern IT-based bike-sharing systems applying electronic access technologies are palmily developed in Chinese big cities (Liu, Jia and Cheng, 2012). However, there are still practical constrains for PBSP in operations, the first of which is the unbalance of demand and supply in rush hours (Alvarez-Valdes et al., 2016). Parking positions provided by the docking stations in central business districts are typically very limited. On the other hand the bikes are much less used in spare times (Liu, Li and Xu, 2011). As a result, the turnover rate of PBSP is rather low, leading to low rental revenue accordingly. Secondly, active usage for pubic bicycles are limited due to non-optimal distribution of bike stations, which also undermines the efficiency of PBSP with regard to solving the "last mile" problem (Liu, Jia and Cheng, 2012). Also, from the perspective of profitability, PBSP requires vast amounts of capital investment in early stage for bike purchasing and building docking stations. Stakeholders invest huge capital to cover daily repairing and maintenance expenses, while the rental revenue is usually too low to breakeven the investment in any reasonable horizon (Zhao and Zhang, 2014).

In addressing these problems, a new sharing-bike scheme was developed firstly by OFO in 2014. It develops an operation model with the integrated "APP+GPS" system (Xu and Qiu, 2018). Thanks to wide accessibility of smart phones payment, the new sharing bikes are labeled with unique QR codes for the bikes to be locked, and for the use to be tracked and paid (Josh, 2017). Users are allowed to ride and park the free-floating sharing bikes anywhere allowed to park because GPS on the bike is continuously locating the bikes, and the locations can be seen in apps with mobile phones. It also prevent stealing and help users find nearest bikes (Ge, 2017). MOBIKE, the second non-docking sharing-bike company, emerged in Shanghai in 2016. By 2017, the number of active bike users with MOBIKE and OFO reached more than two hundred million (Jia, 2018). The success of these two largest sharing bike startups then incited more investors and companies to tap into the market. There were about 25 new bike-sharing brands, and more than 200 million registers in China and about 60 millions of sharing bikes released in Shanghai alone in 2017 (Ma, Zhang and Wang, 2017). Facing fierce homogeneous competition, companies attempt to increase market share usually have to offer more bikes (OFO BIKE SHARING: RIDING ON A BUMPY ROAD, 2017). However, almost all firms are confronted with the same challenge of lacking clear strategy to increase profit except relying on basic rental charges, in addition to problems of theft, vandalizing, and massive of scrap bikes (Sherisse, 2018).
With these concerns, Xu and Qiu (2018) indicated that the main task to promote the new bike-sharing system is to explore a suitable and sustainable business and profit-making model. Surprisingly, little research has investigated possible profit models from the perspective of optimal service charges, which is the essence of bike-sharing industry (Zhang, 2016). He (2017) illustrated that the satisfaction of users is the keystone to increase the long term industry profit. Positive experience of riding sharing bikes may help to retain users and keep increasing the rental revenue (Zhang, 2016). Hence, it is crucial to understand the factors affecting sharing bikes users' satisfaction, which is one fold of the objectives of the current study. For this purpose, the study applies the structural equation model (SEM) to analyze the potential factors affecting the degree of customer satisfaction towards various bike-sharing brands in the market and provide measures on improving operating profits for the firms in the industry.

2. Bike Sharing in China

According to Xu and Qiu (2018), OFO occupies the largest proportion of the Chinese bike sharing market with a market coverage rate of about 51.2%, while that of MOBIKE is 40.1%. These two largest bike-sharing startups have different operating models but both are faced with problems such as high fix cost in bike production and lacking of sustainable profit model (Wang, 2017). OFO, emerged as a university startup project in 2014, is the first sharing bike platform. Since 2015, it has released yellow-colored sharing bikes in more than 150 cities around the world with more than one hundred millions of registered users (Tu, 2017). In 2017, OFO completed E round financing, and about 7 hundred millions of dollars were invested. The funding used mainly to purchase bicycles for business expansion (Yu and Shang, 2017). OFO focuses on bike-sharing platform alone and does not participate in bicycle design and production. Directly purchasing bikes from bicycle producers leads to high fix cost and high operating cost in maintenance and repair (Yang and Huang, 2017). MOBIKE was founded in Beijing in 2016 and released its first orange-colored sharing bicycle in Shanghai. It has operations in around 130 cities globally with five million bikes and more than 100 million registered users in June 2017(Qin, 2018). She stated that about 3 hundred million dollars have been invested at the beginning of 2017 to support its fast expansion. Unlike OFO, MOBIKE engages research and development of bikes and managing the entire life cycle of sharing bicycles from designing, producing, maintaining to recycling (Jin and Wu, 2018). It costs about 3000 RMB to produce an innovative and unique bike (Huang et al, 2018).

Du (2017) implied that large expenditure on bike manufacturing is a major constraint for sharing-bike firms. In the early stage of OFO's development, the main resources of bikes were students' secondhand bikes, implying lower cost but also lower quality (Zhang, Sun and Sun, 2017). With rapid expansion, OFO started to collaborate with traditional bicycle producers such as Yongjiu and Phoenix, which helped to standardize production and effectively contain cost (Zhang, Sun and Sun, 2017). In 2017, more than 10 million yellow bikes released in China. The largest proportion of cost pertains to bike production with about 300 RMB per bike. Another large component expenditure is for maintenance and repair as sharing bikes are prone to be easily damaged by vandalizing and bad weather (Tang, 2017). To lower the damage rate and increase average using time, more sophisticated technologies such as solid inner tube need to be applied in production, incurring more fixed investment (Wang et al, 2009). Thus, MOBIKE has chosen to design and produce its own bikes. It innovates and applies several technologies including flat tires and transmission shaft for enhanced durability (4 years+) and all weather riding (Ge, 2017). This business model requires high expenses in the bike design but can lower daily maintenance and repair needs. However, MOBIKE's bicycles are heavy and quite different from traditional ones, which may contribute to negative riding experiences (Tu, 2017). Further support on R&D should be indispensable to reduce production cost and increase user satisfaction (Jin and Wu, 2018).

Zhang, Sun and Sun (2017) estimated that the production cost per bike of 300RMB would correspond to repair cost of 1 RMB per bike per day. Assume that users pay 1 RMB for each time approximately and the using frequency is about 10 times per day per bike, it would take three months to recover the cost for one bike. Through releasing more bikes, the companies expect to attract more users and improve use frequency (Jin and Wu, 2017). With fixed service fee per each ride, about 0.5 to 1 RMB, high using frequency per bike implies high daily rental profits. However, there exists a critical number of launched sharing bikes in the market (Gan et al, 2018). At the early stage of releasing, the increment of sharing bikes can fulfill excess demand. When bikes gradually spread out and form a scale effect, operators with higher coverage rate will have more users. However, when the number of bikes larger than the critical number, excess supply will decrease the using frequency per bikes. Hence, continuously releasing bikes is not an optimal approach to increase profit. Other approaches need to be developed to guarantee the profitability. Ge (2017) explored China's bike-sharing startups future profit model by constructing the value network model and concluded that users' satisfaction plays an important role in achieving sustainable profitability. Moreover, Tang (2017) illustrated that providing quality services to users and increasing public satisfaction could be beneficial to generate revenue. Jin and Wu (2018) discussed that as now every operators has similar products, providing better services and optimizing users' experience could attract more users and help them be distinguished from their rivals. Guo et al (2017), using a bivariate ordered profit model, identified the factors affecting bike-sharing usage and degree of satisfaction in Ningbo and found that there is a significant positive correlation between bike sharing usage and user satisfaction. These studies show that a better understanding of the factors affecting the degree of bike-sharing user satisfaction can help to optimize user's experience and develop increments in usage and profits.

3. Analysis of Factors

Considerable previous studies advocate safety and green transport. For example, Yang and Huang (2017) indicated that tire slip, brake failure and improper traffic behavior may pose safety problems. Moreover, Qian, Wang and Niu (2013), using data collected in Suzhou, concluded that sharing bikes safety has significant influence on the degree of customer satisfaction. Zhao and Zhang (2014) illustrated that environmental friendly properties of sharing bikes are strongly advocated and is a global trend for partially curbing the air pollution problems. Secondly, as shown by Guo (2014), convenience and easy accessibility have positive impact on user satisfaction. In addition, free-floating sharing bike scheme has been implemented in efforts to mitigate gridlock, enhances short distance commuting for the "last mile" trip that connects home with the public transit station (Karki and Liu, 2016). Thirdly, better bicycle distribution and parking could contribute to bike-sharing usage experience. Feng (2017) reported that 55.2% of a survey respondents complained that bikes could not reached around subway or bus stations in rush hours or when they wanted to ride; and 41.4% of them concerned about the availability of bikes when they were taking a round trip. Hence, distributing right number of sharing bikes in users different parts of cities and repositioning bikes timely may help improving user satisfaction. Although free floating sharing bikes are generally more preferable by users (Me, 2016), Xu and Qiu (2017) cautioned about the negative consequence of unlimited increasing of free floating sharing bikes and lack of scrap bicycles recycling (e.g. discarded sharing bikes have eroded public walking or leisure spaces). Thus standardized management of bike parking may impress users. Fourthly, the main characteristic of sharing bikes such as fashion appearance and functions would also effect the usage. Tu (2017) argued that what sharing-bike users pay for is not the bicycle but its using value and functions. He (2017) analyzed that fashionable appearance and special designation of sharing bikes attract younger users who can be self-adaptive to newest sharing bikes. Yan and Zhang (2017) suggested that the sharing bicycle operators should adhere to the "human-oriented" principle, and make efforts to optimize the versatility, the performance and the structure of their products to meet users' needs. Finally, service and maintenance may positively relate to user satisfaction. Large number of broken or unqualified bikes would discourage usage. Bike sharing companies should check and maintain bikes in service timely for better customer experience (Qian, Wang and Niu, 2017). A user-friendly app could also be helpful to increase the usage of sharing bikes. Ma, Zhang and Wang (2017) emphasized that perceived usefulness and perceived ease of use of bike-sharing app have a significant influence towards user satisfaction.

Summarizing of the qualitative description factors based on existing literature, we have the following five hypotheses regarding the contributing factors of user satisfaction. (H1): Safety and green transport have a positive effect on bike-sharing user satisfaction. (H2): flexibility and convenience have a positive effect on bike-sharing user satisfaction. (H3): distribution and parking have a positive effect on bike-sharing user satisfaction. (H4): fashion and property have a positive effect on bike-sharing user satisfaction. (H5): service and maintenance have a positive effect on bike-sharing user satisfaction. And the following Figure1 outlines all the candidate variables and corresponding sub-category parameters that may collectively model the user satisfaction.

Factor	Item	Details
H1: Safety and green transport	X11	Safety and high quality
	X12	Low-carbon and green means of transportation
	X43	They are durable and can bear extreme weather condition.
H2: Flexibility and Convenient	X21	I can choose my own route
	X22	It is convenient to connect with subway and bus stations
	X23	Riding bikes can avoid traffic jam and save time
	X56	It is easy to pay the rent fee.
H3: Distribution and Parking	X31	The distribution is reasonable and easy to find a bike when you need it.
	X32	It is convenient to park a bike without limitation
	X33	The management of distribution and parking is good
H5: Fashion and Property	X41	Their appearance and construction are good.
	X42	They are consumer-friendly and can provide high quality user experience.
	X44	The lock construction is reasonable and it is consumer-friendly
H5: Service and Maintenance	X51	The registry and login processes are consumer-friendly.
	X52	APP can provide accurate parking location.
	X53	The unlock process in APP is sensitive.
	X54	The deposit is reasonable.
	X55	The rent fee is reasonable.
	X57	It provides attractive coupons.
	X58	It often provides interesting riding activities to attract more users.
	X59	It arranges timely maintenance.
	X50	It responds timely to customers' feedback.
User satisfaction	X61	I can choose my own route
	X62	It is convenient to connect with subway and bus stations
	X63	Riding bikes can avoid traffic jam and save time

Figure 1: Hypothetical model of residents' satisfaction to use sharing bikes

4. Methodology and Data

The questionnaire method is applied to validate the hypotheses drawn from the above theoretical overview. The survey includes both demographic questions and responses to the hypothesize factors towards user satisfaction. Each question in the five categories was designed using a five-point Likert scale, with solicited responses ranging from strongly agree (5) to strongly disagree (1). Moreover, before the formal questionnaire was launched, a small-scale pre-survey with five students was conducted to test logical consistency, literal mistakes and contextual relevance. After such identified issues being addressed, the finalized survey, containing 33 questions, was made available at www.wjx.cn, and then shared with consented sharing-bike users on Wechat for them to answer the designed questions.

This survey yielded 346 valid questionnaires and the descriptive statistics of respondent characteristics are shown in the Table 1. Furthermore, the average scores and variance of each variable are shown in Table 2. Yan and Zhang (2017) stated two conditions on samples for the SEM results to be significant. Firstly, SEM requires that the sample size be larger than 200. Secondly, the ratio of sample size (N) and the number of observation variables (P) should larger than 10. Clearly, the current survey meets both the conditions.

Table 1: Demographic statistics of respondent characteristics

Variables	Categories	Percentage (%)
Age	<20	6.9
	21-30	33.05
	31-40	16.38
	41-50	35.92
	>50	7.76
Education	Up to primary school	0.29
	Secondary school	0.29
	High school	12.64
	Bachelor’s degree	77.87
	Graduate degree	8.92
occupation	Student	30.46
	Office worker	56.03
	Free-lancer	8.33
	Retired/House wife	2.3
	Others	2.87
Income(yearly, NY)	<2000	19.54
	2000-5000	39.37
	5000-10000	28.54
	>10000	12.64
Purpose	Transition between	43.1
	stations	60.63
	Daily short-distance	2.87
	travel	39.08
	Bicycle training	4.6
	Travel commute	9.2
	Participate bicycle event	
	Others	
Frequency	Seldom	69.54
	1-2 times per week	13.79
	3-5 times per week	10.34
	Almost daily	6.32
Distance	0-1 km	35.34
	1-3 km	54.31
	>3 km	10.34
Average using time	0-15 mins	54.02
	15-30 mins	38.22
	30-60 mins	6.32
	>1 hour	1.44

Table 2: Average scores and variance of each item

Factor	Item	Average Scores	Variance
Safety and green transport	X11	3.73	1.114
	X12	4.63	.737
	X13	3.36	1.627
Flexibility and Convenient	X21	3.71	1.464
	X22	4.08	1.304
	X23	3.08	1.979
	X24	4.19	.965
Distribution and Parking	X31	3.08	1.979
	X32	3.91	1.100
	X33	3.85	1.195
Fashion and Property	X41	3.85	1.195
	X42	3.36	1.627
	X44	3.36	1.627
Service and Maintenance	X51	4.07	1.143
	X52	3.93	1.300
	X53	3.99	1.214
	X54	3.32	1.744
	X55	3.90	1.346
	X57	3.87	1.348
	X58	3.82	1.330
	X59	3.28	1.598
	X50	3.23	1.571

SEM is chosen for the current study because of its number of attractive features. Firstly, SEM allows errors to be included in both independent variables and dependent variables, and it can explore the structure of and relationship between of factors (Huang and Zhou, 2007). Secondly, SEM is a powerful to estimate the fitness of conceptual models, providing modification indices to improve model fitting. Thirdly, SEM conducts several important aspects of multivariate analysis, such as regression analysis, factor analysis and path analysis, in an integrated style. SEM, as defined by the following equations, focuses on confirmatory analysis by expressing the results using causal model or path diagram.

$$\eta = B\eta + \Gamma\xi + \zeta \tag{1}$$

$$Y = \Lambda y\eta + \varepsilon \tag{2}$$

$$X = \Lambda x\xi + \delta \tag{3}$$

wher X and Y separately represent the vectors consisting of endogenous and exogenous observed variables ; ξ and η are endogenous and exogenous latent variables ; Λy and Λx indicate the relationship between the corresponding endogenous observed and latent variables as well as exogenous observed and latent variables ; δ and ε are measurement errors of X and Y; Γ explains the influence of exogenous latent variables on endogenous latent variables ; B states the relationship of endogenous latent variables ; ζ is residual error of the structural model and tells the unexplained parts of η. After establishing theoretical assumption model, which contains the relationships between latent variable and observation variable , an estimated covariance matrix , E, is derived under the condition of q estimate parameters. Then maximum likelihood estimate (MLE) or partial least square estimate (PLS) is used for parameter estimation to narrow the gap between E and S, where S is defined as the sample covariance matrix (Huang and Zhou, 2007).

5. Results and Evaluation

AMOS version 22 was used to analyze the hypotheses generated. Firstly, the measurement model was evaluated using confirmatory factor analysis, reliability test and convergent validity measurement. The factors in CFA for this model were obtained based on the hypotheses given by Figure 1. Reliability values for five main sections of the questionnaire was measured by Cronbach's Alpha using SPSS. To illustrate the internal quality of the model and convergent validity, the composite reliability (CR) of latent variables and average variance extracted (AVE), the formulas of which are as follows, were calculated using factor loadings or the standardized regression weights which indicated the importance of observation variables to their latent variables.

CR = (square of the summation of the factor loadings)/ {(square of the summation of the factor loadings) + (square of the summation of the error variances)}
AVE = (summation of the square of the factor loadings)/ {(summation of the square of the factor loadings) + (summation of the error variances)}

The output of CFA was shown in Table 3 and Figure 2. The factor loading values are between 0.462 and 0.893, which implies that the constructs in the model are satisfactorily reflected by observations (Wu, 2009). The model is significant at 0.01 level as confirmed by the t-test. The reliability of the questionnaire was assessed by Kaier-Mayer-Olkin (KMO) value and Barlett's test which is 0.945 in this model, indicating that the questionnaire is sufficiently reliable tool for measuring sharing bike user satisfaction degree. Moreover, the value of Cronbach's alpha of the survey in overall is 0.822 and is large than 0.7 for every factor, indicating a enough reliability (Zhou, 2017). According to Wu (2009), a CR value of 0.6 or above and an AVE value of more than 0.5 are significant. As seen from Table 3, all CR values are above 0.6 and the AVE values are above 0.50, which indicates the heterogeneity among variables and each observation variable can explain their latent variable well, hence establishes the convergent validity. The discriminant validity was assessed to ensure that there is no measure which is the reflection of some other variable. As can be seen in Table 4, values in the diagonal, which are the square root of the corresponding AVE values, are larger than its correlations with all other constructs, hence shows the discriminant validity.

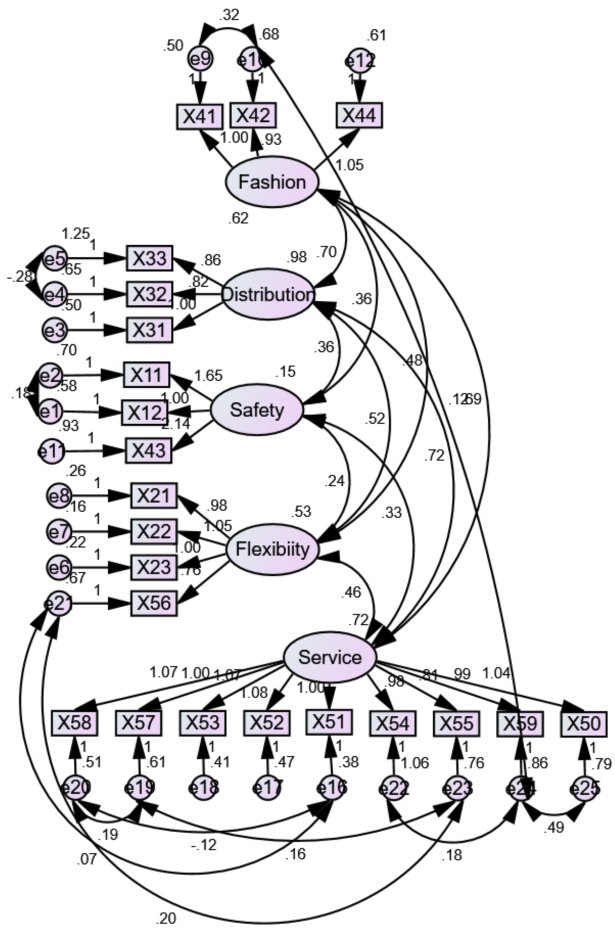

Figure 2: The diagram of CFA

Table 3: Result of CFA for measurement model

Construct	Item	Internal reliability Cronbach Alpha	Convergent Validity		
			Factor Loading	Composite Reliability	Average Variance Extracted
Safety and Green Transport	X11	0.776	0.681	0.6414	0.5483
	X12		0.462		
	X13		0.654		
Flexibility and convenience	X21	0.887	0.817	0.8888	0.7274
	X22		0.893		
	X23		0.847		
Distribution and Parking	X31	0.714	0.816	0.7559	0.5116
	X32		0.710		
	X33		0.604		
Fashion and Property	X41	0.809	0.739	0.7859	0.5519
	X42		0.665		
	X43		0.727		
Service and Maintenance	X51	0.924	0.817	0.9212	0.541
	X52		0.805		
	X53		0.816		
	X54		0.635		
	X55		0.659		
	X56		0.684		
	X57		0.742		
	X58		0.788		
	X59		0.674		
	X50		0.705		

Table 4: Discriminant validity of constructs

	Service	Fashion	Flexibility	Distribution	Safety
Service	0.740				
Fashion	0.692	0.787			
Flexibility	0.462	0.481	0.530		
Distribution	0.721	0.696	0.523	0.784	
Safety	0.333	0.360	0.243	0.359	0.745

Table 5: Fit Indices

Fit Measures	Initial Model	Modified Model	Ideal Value
Chi-square/df	3.242	2.773	<3
RMSEA	0.080	0.071	<0.08
GFI	0.836	0.854	>0.9
AGFI	0.781	0.809	>0.9
IFI	0.916	0.934	>0.9
TLI	0.898	0.919	>0.9
CFI	0.916	0.933	>0.9

Then the structural model was constructed and estimated using the maximum likelihood method (MLE). The initial model was constructed based on CFA and hypothesizes before and the result is presented in table 5. It can be seen that the values of some fitness indices are not acceptable. Hence, the modification need to apply based on modification indices (M.I.). Based on the principle that release one relationship per time, the correlation among some measurement errors was established, for instance, the correlation between e9 and e10, in order to decrease chi-square value and increase p value (Wu, 2009). The final result of structural model is presented in Fig.3 and table 5 and all the fitness indices from this study are larger than the ideal values suggesting a good model fit.

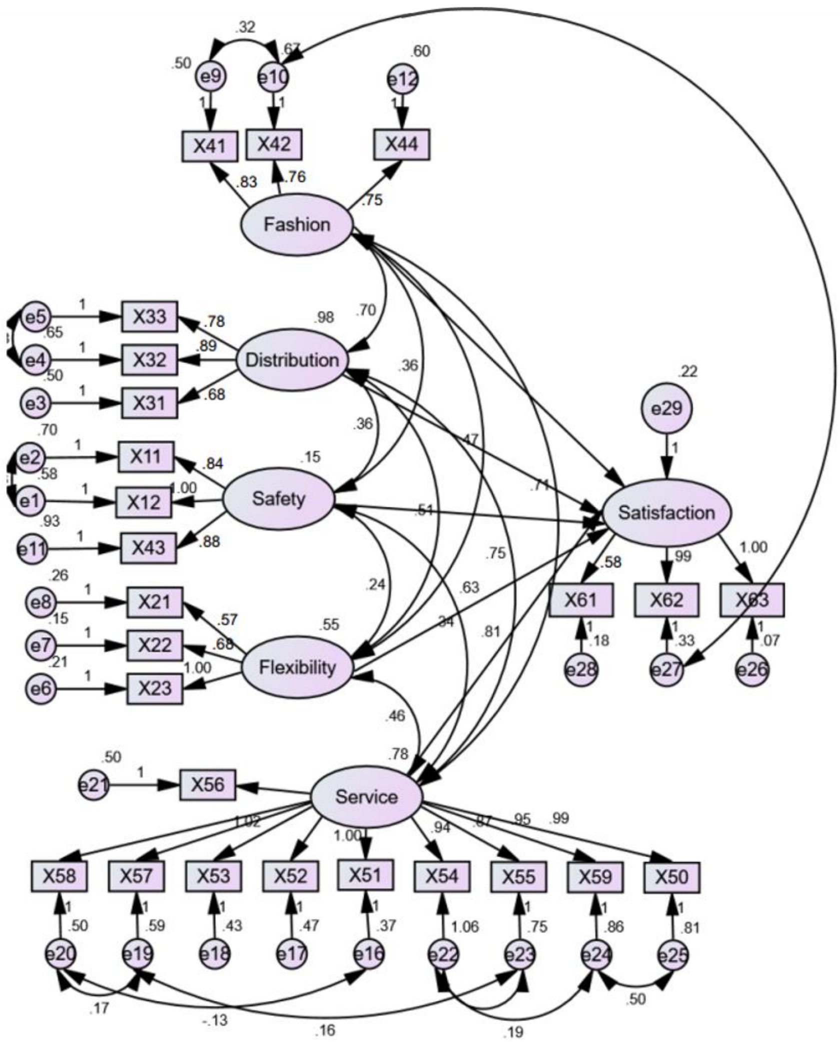

Figure 3: Modified Structural Model

Furthermore, the significance of each hypothesis has been tested in P values and the results are presented in table 6. In the initial model, only H2 is supported. In other words, the regression weight for Flexibility in the prediction of Satisfaction is significantly different from zero at the 0.001 level (two-tailed). Based on the modification indices, several correlations were constructed in order to decrease P value. After modification, it is apparent from table 6 that H1, H2 and H5 are supported in final model. As for H1, it is significant that the factor, safety and green transport, has a positive effect on user satisfaction. This means the degree of user satisfaction will increase when they use more safe and environmental friendly sharing bikes. Meanwhile, flexibility and convenience have a positive effect on bike-sharing user satisfaction. Thus, H2 is supported. This indicates that the greater flexibility and convenience of sharing bikes, the greater user satisfaction.

Furthermore, service and maintenance have a positive effect on bike-sharing user satisfaction. Thus, H5 is supported. This implies that user satisfaction will rise with the better service and maintenance. In particular, it is interesting to find that the coefficient of the path starting from service and maintenance to user satisfaction in Fig. 3 is 0.81 larger than any other path coefficients implying that the factor, service and maintenance of sharing bikes, has the largest effect on user satisfaction, followed by flexibility and convenience and then safety and green transport.

Table 6: Significant Test (P Value)

Hypothesis	First Model	Decision	Final Model	Decision
H1: Safety and green transport have a positive effect on bike-sharing user satisfaction.	0.0298	Not supported	***	Supported
H2: Flexibility and convenience have a positive effect on bike-sharing user satisfaction.	***	Supported	***	Supported
H3: Distribution and parking have a positive effect on bike-sharing user satisfaction.	0.0781	Not supported	0.0460	Not supported
H4: Fashion and property have a positive effect on bike-sharing user satisfaction.	0.0423	Not supported	0.0241	Not supported
H5: Service and maintenance have a positive effect on bike-sharing user satisfaction.	0.0285	Not supported	***	Supported
Notes: *** means the hypothesis is significant at the 0.01 level (two-tailed)				

However, H3 and H4 failed the significant test which suggests that there is no evidence to prove that these factors will affect user satisfaction. One of the possible explanations for this is that people who participated in this survey think that the fashion and distribution of sharing bikes are not as important as other factors.

6. Conclusion and Discussion

The purpose of this study is to explore a feasible profitability model for Chinese new bike-sharing companies from the perspective of rent profit. The fee for every use is about 0.5-1 RMB per hour and the average using time is less than 30 minutes (Table 1). It could be concluded that the rent profit can rise with the increase of using frequency which is positively correlated to user satisfaction supporting by the review of literatures. Hence, this study analyzed factors affecting user satisfaction. In this investigation, the factors, safety and green transport, flexibility and convenience and service and maintenance were founded that they had a positive effect on user satisfaction. The empirical research presented some key findings.

Firstly, the results implied that the factor, safety and green transport, had a positive effect on users satisfaction. This result matched that observed in earlier studies, for instance, the study constructed by Zhou (2017). A possible realistic explanation might be that sharing bike is a green transport to reduce air pollution. Compared with traditional mode, the environment-friendly concept attracts and satisfies a substantial amount of users. However, as shown in table 2, the average score of X11: Most sharing bikes have sound quality is relatively low which suggests sharing bike operators should research and develop more innovations on the designation of sharing bike to provide more qualified bikes in order to increase the user satisfaction.
Secondly, the results revealed that the factor, flexibility and convenience, influenced the user satisfaction positively which implied that the factor could be the main reason to retain Customer Loyalty. Table 1 indicated that 30.46% of sharing bike users is students and 56.03% is office workers whose daily transport purpose is commuting. With rigid travel time, they could be the affected mainly by flexibility choice of transportation. Chinese new sharing bikes are free floating and users are allowed to pick and park the bikes anywhere. This feature is beneficial to help users to save time and solve the “last mile” problem.
Thirdly, the result showed that distribution and parking of sharing bikes have no significant influence on user satisfaction. However, Qian, Wang and Niu (2013) concluded that this factor would have positive relation with public sharing bike user satisfaction. In the case of free-floating sharing bike, the distribution and parking of bikes depends on users and no bike dispatchers are responsible for repositioning sharing bikes. In table 2, the low average scores of items of this factor and the relatively high average scores of overall user satisfaction could be explained that though the distribution and parking of Chinese new sharing bike have some problems or could not satisfy the users’ demand or require, people still believe that the Chinese bike sharing scheme could be better in the future. Moreover, due to fierce competition, all kinds of sharing bike are occupying large the space of roads and people could find the bike anywhere (Yu and Shang, 2017). Hence, the effect of unreasonable distribution and parking on user satisfaction may not be obvious.
These findings may have useful implications for proposing improvements to Chinese new bike-sharing scheme and operators could construct possible profit model with respect to rent profit based on the study. For example, the findings suggested that a safe and high-quality sharing bike could increase the user’s satisfaction. Companies should make more efforts on innovations in order to design a better sharing bike and then provide better service to users. The traditional bicycle’s easy-to-use hub and spoke model have low durability and could be eroded in extreme weather or lack of maintenance which could cause accidents when riding. The chain-driven of traditional sharing bikes requires frequent maintenance and operators could research and develop some new techniques to solve this problem. For example, Solid tire, a new product used in MOBIKE’s sharing bikes, does not need inflation and could avoid the risk of deflated. Thus, the possible profit model with respect to rent profit could be construct based on these information as the higher degree of usage the more rent profit could be obtained.

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