A study on Online Dating Satisfaction of University Students in Kunming Based on Structural Equation Modeling

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Abstract. With the rapid development of the sharing economy, Net job passenger satisfaction has received attention from a wide range of scholars as well as customers. China's online car users are mainly concentrated in young people's groups, and college students, as a part of them, have a higher demand for online car. This paper takes university students in Kunming City as the survey object, and analyzes the passenger satisfaction with internet dating through questionnaire survey in terms of comfort, economy, reliability, convenience and safety. By constructing a structural equation model, the results show that the comfort, economy, reliability, convenience and safety of online car service have a greater correlation with satisfaction, and these findings are helpful for us to put forward suggestions to improve passenger satisfaction from multiple perspectives in a targeted way, for the reference of car companies and drivers, and to be applied in reality.

Keywords: Internet taxi; Questionnaire survey; Passenger satisfaction; Structural equation modeling

1 Introduction

According to a report by China Business Industry Research Institute (CBIRI), as of June 2023, China's online taxi users reached 472 million, an increase of 34.92 million compared to December 2022, accounting for 43.8% of the overall number of Internet users. Unlike traditional cabs, online cab services are dispatched online through a platform or system, and the interaction between drivers and passengers uses the platform or system as a bridge as a way to fulfill passenger needs. Online taxi passenger satisfaction is a very important factor in online taxi operation. Pratiwi and Dina et al [1-2] considered customer satisfaction as a comparison between customers' expectations and customers' actual feelings concluded that vehicle quality, driver service, and the quality of use of the application had a significant effect on customer satisfaction; the study concluded that passenger loyalty was positively correlated with satisfaction using a partial least squares model. Wei Hu [3] investigated that a part of people were dissatisfied with the waiting time under the background factor of capacity, and proposed to increase the number of drivers, improve the capacity and shorten the waiting time.Choy Johnn et al [4] integrated the SERVQUAL model into the European perspective of the two-dimensional concept of service quality, and confirmed that the impact of service quality on satisfaction is multidimensional, including functional quality and outcome

MSEA 2024, May 24-26, Jinan, People's Republic of China

DOI 10.4108/eai.24-5-2024.2350152

quality.Ruiz et al. [5] introduced a machine learning model to measure and predict passenger satisfaction and finally concluded that the random forest model is the most effective.

In recent years, young groups are the main force of using online dating, which is even more represented by college students. Xu Wei and Zuo Wenming[6-7] took college students as the research object, and used a combination of BN+PLS-SEM to explore the influence of personal heterogeneity on loyalty and satisfaction of online dating based on study time and family income. Li Gang [8] takes college students as the research group and combines the hierarchical analysis method and fuzzy comprehensive evaluation method to establish a three-tiered evaluation framework for online dating service quality, and studies the impact of loyalty to using online dating and the impact of using online dating on subjective well-being based on service quality. With this, this paper adopts structural equation modeling to conduct passenger satisfaction research for university students in Kunming City, hoping to give some effective suggestions to enterprises to improve the market of internet dating, as well as to promote the development of urban transportation.

2 Theoretical model of satisfaction

2.1 Principles of structural equation modeling

Structural Equation Modeling (SEM) is a statistical method to analyze the relationship between variables based on their covariance matrix. There are three kinds of variables in structural equation modeling namely latent variables, observed variables, and residual variables; the model consists of measurement model and structural model [9]. Among them, the measurement model consists of latent and observed variables; the structural model is an illustration of the causality model of latent variables, where the latent variable as a cause becomes the exogenous latent variable, denoted by the symbol ξ, and the latent variable as an effect becomes the endogenous latent variable, denoted by the symbol η.

The structural modeling formula for SEM is:

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

where B denotes the relationship between endogenous latent variables; Γ denotes the effect of exogenous latent variables on endogenous latent variables; and ζ is the residual term of the structural equation, reflecting the part that fails to be explained in the equation.

The measurement model equation for SEM is:

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

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

where Y denotes the endogenous observed variable; X denotes the exogenous observed variable; η denotes the endogenous latent variable; ξ denotes the exogenous latent variable; Λy is the relationship between the endogenous observed variable and the endogenous latent variable; Λx is the relationship between the exogenous observed variable and the exogenous latent variable; and $\varepsilon\delta$ represents the measurement error.

2.2 Research hypothesis

This study investigates the relationship between the perceived level and satisfaction of online car riders of college students in terms of five dimensions: comfort, safety, convenience and speed, economy and reliability. Based on the five variables, the following hypotheses were made prior to the study: convenience, reliability, comfort, and safety have a positive and significant effect on the satisfaction of internet car rental passengers, while economy has a negative and significant effect on the satisfaction of internet car rental passengers.

2.3 Questionnaire design and model construction

Based on previous researchers' studies on online car rental satisfaction [10], a questionnaire was designed for college students' online car rental satisfaction, which contains two parts, the first part is the students' personal basic information, including: gender, grade, usually adopted taxi software, and the frequency of online car rental; the second part is the factors related to the satisfaction of the online car rental service, which is based on a 5-point Likert scale, including convenience , reliability, comfort, safety and economy. The specific index system is shown in Table 1.In addition, an SEM model of net taxi satisfaction was constructed in Amos (see Fig. 1), where e1- e17 are random error terms.

Table 1. System of indicators.

Latent variables	Variable coding	Observed variables
Convenience	BJ1	Convenience of APP use
	BJ2	Convenience of car reservation
	BJ3	Convenience of payment
Reliability	KK1	Neighborhood dispatch
	KK2	Punctuality and reliability
	KK3	Reliable service
Comfort	SS1	Comfortable interior environment
	SS2	Smooth vehicle operation
	SS3	Good service attitude of the driver
Economy	JJ1	Expense details are not transparent
	JJ2	Fees are unreasonable
	JJ3	Unsatisfactory fees
Security	AQ1	Personal privacy security
	AQ2	Security of payment account
	AQ3	Personal safety
Satisfaction	MY1	Willing to continue to use online car rental service
	MY2	Willing to recommend to people around me

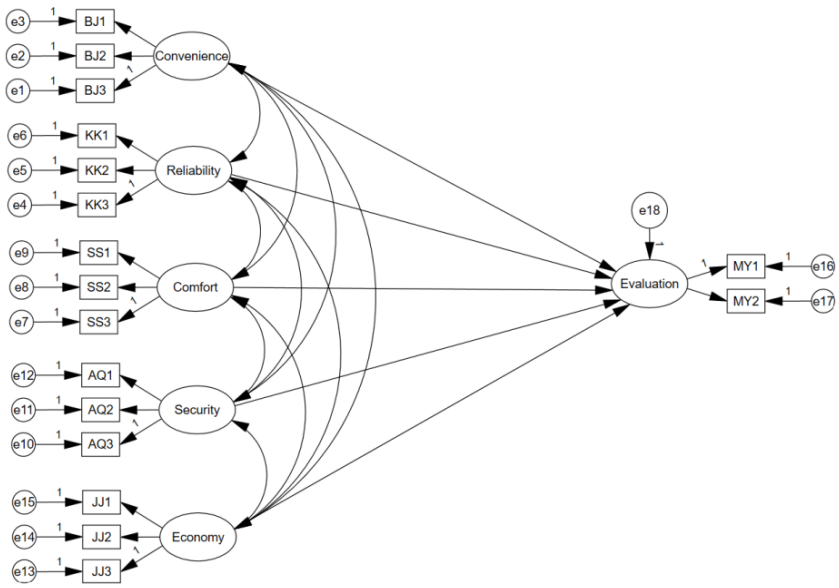

Fig. 1. Initial model.

3 Model data analysis

According to the index system, a questionnaire was designed to meet the study, and the target respondents were college students studying in Kunming, who participated in the questionnaire survey through a combination of offline filling as well as online code scanning. Structural equation modeling requires that the ratio of sample size to the number of observed variables be controlled between 10:1 and 15:1,207 questionnaires were returned, 203 questionnaires were valid, and there are 17 observed variables in this paper, which meets the requirements.

3.1 Reliability Analysis

Reliability analysis is an essential step in sample analysis to check the reliability and consistency of the data. The method used in this paper is called Cronbach's alpha, which is a common method in social science research proposed by Lee Cronbach in 1951. The value of reliability ranges from 0 to 1, and the closer to 1 the higher the reliability and consistency. Generally, an alpha value greater than 0.7 is considered acceptable. The results of the reliability test are shown in Table 2.

Table 2. Kronbach factor.

dimension	subject	Correlation of corrected entries to totals	Clone Bach after deletion of items	Cronbach	overall reliability
convenience	BJ1	0.778	0.786	0.867	0.839
	BJ2	0.751	0.809		
	BJ3	0.715	0.846		
Reliability	KK1	0.754	0.816	0.869	

	KK2	0.734	0.832	
	KK3	0.767	0.800	
	SS1	0.772	0.831	
Comfort	SS2	0.787	0.818	0.882
	SS3	0.753	0.849	
	AQ1	0.663	0.775	
Security	AQ2	0.698	0.741	0.824
	AQ3	0.684	0.756	
	JJ1	0.756	0.743	
Economy	JJ2	0.725	0.777	0.846
	JJ3	0.666	0.838	
Satisfaction	MY1	0.686	-	0.813
	MY2	0.686	-	

From the above table, it can be seen that the total reliability is 0.839 and the subscales are all above 0.8, which means that the scale meets the requirements, the data is more reliable and the reliability test is passed.

3.2 Validity analysis and exploratory factor analysis

3.2.1 Validity analysis

Validity tests are usually performed using KMO measurements and Bartlett's test of sphericity.

KMO measure: the closer the value is to 1, the stronger the correlation is and the more suitable it is for factor analysis. In general, a KMO measure value greater than 0.9 is considered very suitable for analysis; 0.8-0.9 is considered very suitable; 0.7-0.8 is suitable; and less than 0.5 is unsuitable.

Bartlett's test of sphericity: this method is used to test whether there is a correlation between the variables, and when the p-value is less than 0.05, we consider the test passed.

Using SPSS25.0 to test the questionnaire sample data to get, KMO value is 0.816, greater than 0.8, indicating that the sample data is very suitable. Bartlett spherical test probability of significance is 0.000, much less than 0.005, so the variables correlation is very good, The test results are shown in Table 3.

Table 3. KMO measures and Bartlett's test of sphericity.

KMO Quantity of Sample Suitability		0.816
Bartlett's test of sphericity	approximate chi-square	1731.293
	degrees of freedom	136
	significance	0.000

3.2.2 Exploratory factor analysis

Through the software SPSS25.0 run to derive the gravel diagram (as shown in Figure 2) can be seen, the fold line in the component 6 after the decline gradually tends to flatten, indicating that the extraction of 6 common factors is more appropriate. Therefore, a total of 6 common factors were extracted, and the specific results are shown in Table 4, from the data in the table, it can be seen that the common degree of the variables are all above 0.4, indicating that relatively little information is lost, which indicates that the 6 factors screened are well

represented. The maximum factor loading of each measurement item is greater than 0.5, and there is no serious cross-loading (cross-loading are lower than 0.4), each measurement item is clustered under the corresponding factor, and the total explanatory variance is 79.761%, which is greater than 60%, and the six extracted dimensions have strong explanatory strength. Overall, the validity test was passed, indicating that the structural validity of these variables achieved the desired effect.

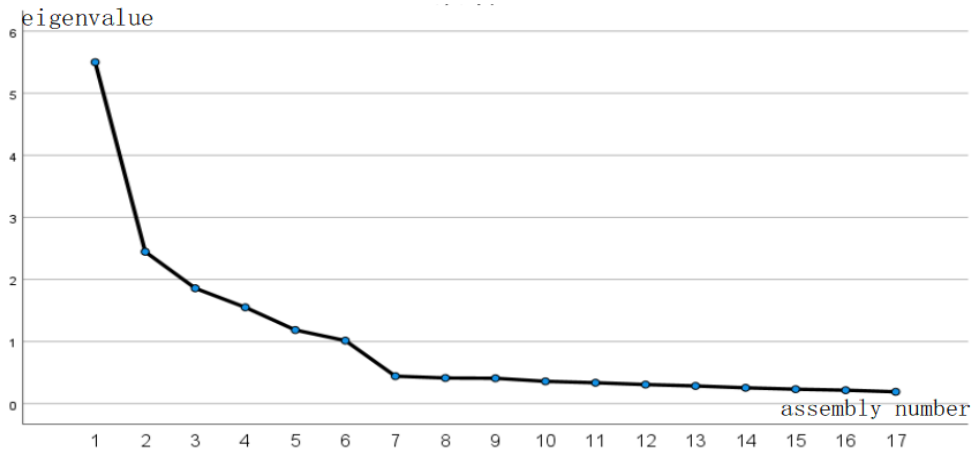

Fig. 2. Gravel chart

Table 4. Exploratory factor analysis

subject	factor loading factor						commonality
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	
BJ1	0.874						0.816
BJ2	0.867						0.793
BJ3	0.858						0.771
KK1			0.845				0.800
KK2			0.824				0.781
KK3			0.880				0.831
SS1		0.832					0.812
SS2		0.861					0.830
SS3		0.867					0.813
AQ1					0.751		0.729
AQ2					0.832		0.793
AQ3					0.814		0.771
JJ1				0.894			0.810
JJ2				0.880			0.792
JJ3				0.844			0.727
MY1						0.823	0.838

MY2						0.863	0.851
eigenvalue	5.501	2.447	1.859	1.551	1.186	1.015	-
variance explained rate%	32.358 %	14.395 %	10.933 %	9.125%	6.977%	5.972%	-
Cumulative variance explained%	32.358 %	46.753 %	57.687 %	66.812 %	73.789 %	79.761 %	-

3.3 Fit Test

Using AMOS software to conduct a validation factor analysis on the five variables of convenience, reliability, comfort, safety and economy, it was found that the main fitting indicators met the criteria of general SEM research, and therefore, the measurement model was considered to have a good degree of fit. As can be seen from Table 5, the actual measurements are all within the range of acceptable indicators and have a good degree of fit.

Table 5. Fit testing.

fitness index	Actual measured value	Acceptable indicators	Compliance with requirements
CMIN	121.270		Yes
DF	104		Yes
CMIN/DF	1.166	<3	Yes
GFI	0.934	>0.9	Yes
RMSEA	0.029	<0.08	Yes
IFI	0.990	>0.9	Yes
TLI	0.986	>0.9	Yes
CFI	0.990	>0.9	Yes
PGFI	0.635	>0.5	Yes
PNFI	0.713	>0.5	Yes

3.4 Evaluation of measurement models

Model evaluation refers to the verification of each hypothetical path in the structural equation model, and the CR coefficients are used to determine whether the model hypotheses reach statistical significance. The following table(Table 6) shows the path coefficients of the measurement model, the loading values of the standardized factors of the latent variables for each measure meet the criterion of a factor loading as large as 0.5; there is no negative measurement error for each research variable, and the standard errors are relatively small; the critical ratio C.R. are all greater than 3.29, which passes the test of the 0.001 level of significance (P-value <0.001, indicated by the "**** " symbol), indicating that the explanatory power of the variable measurement items for the measurement model is strong and the basic fitness of the model is good. The variable component reliabilities are all greater than 0.7; the average variance extractions are all greater than 0.5; they all meet the standard of convergent validity, and the fitness is also in the acceptable range, so the model passes the validation factor analysis test, and the variable dimensions are set up scientifically and reasonably.

Table 6. Validation factor analysis results

trails			Non-standardized loads	S.E.	C.R.	P	Standardized loads	AVE	CR
BJ3	<---	convenience	1				0.778		
BJ2	<---	convenience	0.978	0.083	11.766	***	0.835	0.691	0.870
BJ1	<---	convenience	1.013	0.084	12.077	***	0.878		
KK3	<---	Reliability	1				0.842		
KK2	<---	Reliability	0.966	0.078	12.396	***	0.813	0.692	0.871
KK1	<---	Reliability	0.908	0.071	12.789	***	0.840		
SS3	<---	Comfort	1				0.807		
SS2	<---	Comfort	1.042	0.08	13.095	***	0.868	0.714	0.882
SS1	<---	Comfort	1.035	0.08	12.963	***	0.857		
AQ3	<---	Security	1				0.775		
AQ2	<---	Security	0.939	0.091	10.282	***	0.790	0.612	0.826
AQ1	<---	Security	0.913	0.089	10.206	***	0.782		
JJ3	<---	Economy	1				0.725		
JJ2	<---	Economy	0.975	0.094	10.384	***	0.822	0.658	0.852
JJ1	<---	Economy	1.098	0.105	10.476	***	0.879		
MY1	<---	Satisfaction	1				0.881	0.692	0.817
MY2	<---	Satisfaction	0.919	0.103	8.951	***	0.779		

3.5 Correlation analysis and discriminant validity

This study will use the rigorous AVE method to assess the differentiation validity, that is, each variable AVE open root sign value is greater than the correlation coefficient between the variables, which can indicate that there is differentiation validity between the variables. The distinguishing degree of the variables in this paper is shown in Table 7.The AVE open root sign takes the value of the interval of 0.782 to 0.844, which shows that the absolute value of the correlation coefficient between the variables are smaller than the variable AVE open root sign value, which indicates that the distinguishing validity between the research variables in this paper is better, and meets the requirements of the research.

Table 7. Correlation analysis and differential validity

	Satisfaction	Economy	Security	Comfort	Reliability	convenience
Satisfaction	0.827					
Economy	-0.185	0.804				
Security	0.518	-0.021	0.782			
Comfort	0.470	0.035	0.566	0.844		
Reliability	0.485	-0.094	0.485	0.393	0.832	
convenience	0.384	0.038	0.384	0.307	0.300	0.831

4 Model testing and analysis of results

4.1 Testing of models

In this study, the AMOS software is used to test and analyze the net taxi passenger satisfaction model, and the results of the overall path standardization run of the model are shown in Figure 3, and the path standardization coefficients are all less than 1, which proves that the model is reasonable.

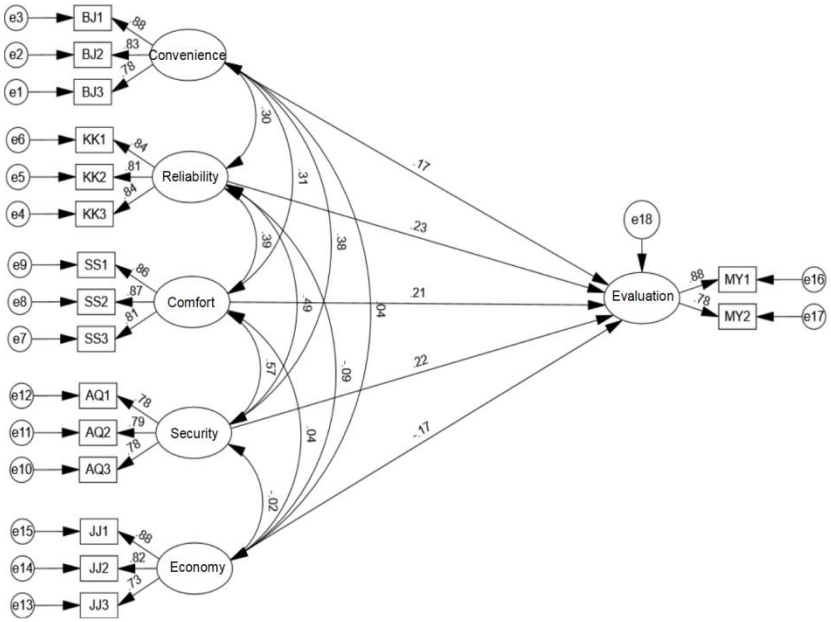

Fig. 3. Standardized path analysis.

The path coefficient analysis of the overall model is obtained as shown in Table 8, and the standardized path coefficients are generally used to measure the strength of the relationship between the potential variables and the observed variables, and the magnitude of the value indicates the degree of correlation between the two variables, with positive or negative indicating positive or negative influence. From the structural equation model test results show that convenience, reliability, comfort and safety have a significant positive effect on satisfaction, with standardized coefficients of 0.175, 0.228, 0.208 and 0.219, respectively, and economy has a significant negative effect on satisfaction, with a standardized coefficient of -0.173. This proves that the hypotheses of H1-H5 in the above article are valid.

Table 8. Path Factor Analysis.

latent variable path	Standardized path factor	S.E.	C.R.
Satisfaction<---Convenience	0.175	0.08	2.194
Satisfaction<---Reliability	0.228	0.085	2.638

Satisfaction<---Comfort	0.208	0.092	2.267
Satisfaction<---Security	0.219	0.116	2.102
Satisfaction<---Economy	-0.173	0.081	-2.400

4.2 Analysis of Empirical Results

The Combining the indicator system in the questionnaire and the above model construction analysis can indicate that the order of importance of the factors influencing the satisfaction of passengers of online car rental is: reliability > safety > comfort > convenience > economy. Overall: Reliability has the greatest impact on online taxi passenger satisfaction, so it is important for passengers that the system is able to dispatch a car near them as soon as possible, and the reliability of the driver's service is also very important, such as answering some common questions of foreign passengers, delivering on time, and not dumping passengers in the middle of the journey. Secondly, passengers also attach great importance to security, the security of personal privacy, payment accounts and personal safety also directly affects the degree of passenger satisfaction. In addition, passengers in recent years also have higher requirements for comfort, the driver can clean the vehicle to ensure a comfortable car environment is very important; there is also the comfort of the vehicle operating conditions, which requires that the qualifications of the driver to meet certain requirements before hauling passengers; in addition, the driver's service attitude can also directly determine the comfort of the passengers. Finally, convenience and economy have a comparable impact on satisfaction. In terms of convenience, it includes the convenience of using the APP, the convenience of booking and the convenience of payment, etc. In terms of economy, people are more concerned about whether the charges are reasonable and whether the details of the charges are transparent. In conclusion, we can improve passenger satisfaction by improving convenience, reliability, comfort, safety and economy, as well as the overall operation level of online car rental and the economic income of enterprises, so as to promote the progress of related industries.

5 Conclusions and recommendations

This article focuses on the research of online taxi travel satisfaction for the special group of college students in Kunming, using structural equation modeling to analyze the effects of convenience, reliability, comfort, safety and economy on college students' satisfaction with online taxi rides, from which it is concluded that convenience, reliability, comfort, and safety have a significant positive effect on satisfaction, and economy has a significant negative effect on satisfaction. Based on the conclusions in the article, suggestions are made for the operation of internet dating to improve passenger satisfaction:

(1) Establishing a perfect customer service system to promptly solve problems and difficulties encountered by passengers during their journeys and improve service reliability;(2) Improve the positioning and alarm system to ensure the safety of passengers; (3) Improve the access qualification of drivers, improve the level of service, which can enhance the comfort of passengers; (4) Simplify the page of the taxi system, so that more people can be clear as soon as possible about the operation of the system, but also to make it more convenient for the user; (5) Expense details are open and transparent, and the charges are reasonable.

In the future, we can investigate the satisfaction of the entire city group of online car travel, and also compare it with other means of transportation, give full play to the advantages of online car itself, and better put forward targeted improvement measures for enterprises and society, improve service quality, and promote the convenience and development of transportation in Kunming City.

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