Factors Influencing Shared E-Bike Usage Intention among College Students in Chongqing: UTAUT-TAM Integration

Chen Cheng[1], Watcharanan Thongma[2], Danaikrit Inthurit[3], Suthira Sitthikun[4]

[1]*Chen Cheng, Department of Digital Economy and Innovation Management (International Program), International College, Maejo University, 853664467@qq.com.*

[2]*Watcharanan Thongma, Lecturer, Department of Digital Economy and Innovation Management (International Program), International College, Maejo University, watcharanan_tm@mju.ac.th.*

[3]*Danaikrit Inthurit, Lecturer, Department of Digital Economy and Innovation Management (International Program), International College, Maejo University, danaikrit_in@mju.ac.th*

[4]*Suthira Sitthikun, Lecturer, Department of Tourism Management (International Program), International College, Maejo University, suthira.sit@gmail.com*

Abstract

This study focuses on students from 5 universities in Dazu District, Chongqing, aiming to explore their willingness to use shared electric bicycles and the influencing factors. It integrates the Diffusion of Innovations Theory, Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and Theory of Planned Behavior as the analytical framework. An online questionnaire was used for data collection, and 391 valid samples were selected from students who have used shared electric bicycles.

The research results show that there are differences in the acceptance factors of shared electric bicycles among students across different theoretical dimensions: in the diffusion of innovations dimension, the key acceptance factors are compatibility and trialability; in the technology acceptance and utilization dimension, performance expectancy and effort expectancy play prominent roles; in the planned behavior dimension, perceived behavioral control is the core influencing factor. Multiple regression analysis results indicate that the most significant factor affecting students' willingness to use shared electric bicycles is perceived behavioral control (regression coefficient = 0.254), followed by performance expectancy (0.188), compatibility (0.165), trialability (0.124), and effort expectancy (0.113).

The conclusions of this study can provide empirical references for operators of shared electric bicycles to optimize their service strategies in university areas, and also

fill the research gap in the interdisciplinary field of "mountainous terrain, college student groups, and willingness to use shared electric bicycles".

Keywords: Shared electric bicycles; Diffusion of Innovations Theory; Theory of Planned Behavior

Background and Statement of the problem

With the continuous development of industry, greenhouse gas emissions have increased significantly, leading to a rapid rise in global temperatures. As of 2024, research by the World Meteorological Organization (WMO) shows that the global average near-surface temperature is 1.55 ± 0.13°C higher than the average level from 1850 to 1900 (State of the Global Climate, 2024). "Carbon neutrality" and "carbon peaking" have become a global consensus. As of 2024, 148 countries worldwide have explicitly put forward carbon neutrality commitments, and China has committed to achieving carbon neutrality by 2060 (Annual Progress Report on Global Carbon Neutrality, 2024).

Green transportation is a core area for carbon reduction. Shared bicycles and electric bicycles, as green and low-carbon travel modes, help reduce carbon emissions and pollutant emissions from urban travel. By the end of 2024, the deployment volume of shared electric bikes in China had reached approximately 7.13 million units, covering 31 provinces, autonomous regions, and municipalities directly under the Central Government, becoming one of the main choices for people's daily commuting (Research Report on China's Shared Electric Bike Industry (2024-2025), 2025).

Chongqing, as a central city in central and western China, has significant topographic relief. The coverage rate of non-motorized lanes in the main urban area is less than 30% (Scientific and Technological Management of Land and Resources, 2024). However, the emergence of shared electric bikes has made cycling feasible in this mountainous city. Chongqing is home to 68 regular institutions of higher education, with a total enrollment of 1.2 million students in higher education, including 1.005 million undergraduates and junior college students. Nearly 90% of college students have a monthly living expense of 1,000-3,000 yuan, and their daily travel distance is mostly 1-5 kilometers, which is highly consistent with the core applicable distance of shared electric bicycles (MITHILA HASAN, 2023).

Dazu District, as a secondary city in Chongqing, has a high concentration of students and incomplete transportation infrastructure. The number of college students in the district exceeds 32,000 (People's Government of Dazu District, 2024), and its terrain features both mountainous and low-hill characteristics, making it typically representative of Chongqing's overall terrain. Currently, shared electric bike brands such as Hellobike and Meituan have been deployed around colleges and universities in Dazu District.

Despite numerous studies on shared bikes and green transport, there is a lack of research examining the relationship between mountainous terrain and college students' acceptance of e-bikes. This study aims to fill this gap by identifying key factors related to technology adoption and exploring the travel decision-making logic of young people under topographic constraints.

Objective

1. To examine the levels of shared e-bike adoption, user acceptance, perceptions, and user behavior in relation to college students' intention to use shared electric bicycles.
2. To analyze the effects of shared e-bike adoption, user acceptance, perceptions, and user behavior on college students' intention to use shared electric bicycles.

Expected benefits

Government Sector: Provide a specific basis for urban transportation planning institutions to allocate facilities, contribute to the development of a green transportation system, reduce the use of fuel-powered motor vehicles, and promote low-carbon travel among citizens.

Enterprise Sector: Help shared electric bicycle enterprises understand the factors influencing Chongqing college students' willingness to use shared electric bicycles, identify key constraining factors for promotion in university areas, and drive enterprises to produce products more suitable for Chongqing's terrain characteristics and college students' consumption preferences, thereby enhancing product market adaptability.

Researcher Sector: Provide reference for scholars conducting further research on the factors influencing college students' willingness to use shared electric bicycles, saving research time and costs.

Conceptual Framework

This study constructs a conceptual framework integrating four theories to explore the influencing factors of college students' willingness to use shared electric bicycles in mountainous areas. The independent variables include three categories: diffusion of innovation factors (Relative Advantage, Compatibility, Complexity, Trialability), technology acceptance and utilization factors (Perceived Usefulness, Perceived Ease of Use, Social Influence, Effort Expectancy, Performance Expectancy), and planned behavior factors (Attitude Toward Behavior, Subjective Norm, Perceived Behavioral Control). The dependent variable is the willingness to use shared electric bicycles.The theoretical basis of the framework is as follows:Diffusion of Innovations Theory: Explains the diffusion mechanism of shared electric bicycles as an innovative travel tool through innovation attributes such as compatibility and trialability (Rogers, 1962).

Technology Acceptance Model (TAM): Focuses on Perceived Usefulness and Perceived Ease of Use to reflect users' acceptance of shared electric bicycles (Davis, 1989).

Unified Theory of Acceptance and Use of Technology (UTAUT): Supplements Performance Expectancy, Effort Expectancy, and Social Influence to enrich the research perspective of technology acceptance dimensions (Venkatesh et al., 2003). Theory of Planned Behavior (TPB): Analyzes the impact of Attitude Toward Behavior, Subjective Norm, and Perceived Behavioral Control on usage willingness from the perspective of behavioral decision-making (Ajzen, 1985).

Based on the above framework, the following hypotheses are proposed:

H1: Relative Advantage has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H2: Compatibility has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H3: Complexity has a negative impact on college students' willingness to use shared electric bicycles in Chongqing.

H4: Trialability has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H5: Perceived Usefulness has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H6: Perceived Ease of Use has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H7: Social Influence has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H8: Effort Expectancy has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H9: Performance Expectancy has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H10: Attitude Toward Behavior has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H11: Subjective Norm has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

H12: Perceived Behavioral Control has a positive impact on college students' willingness to use shared electric bicycles in Chongqing.

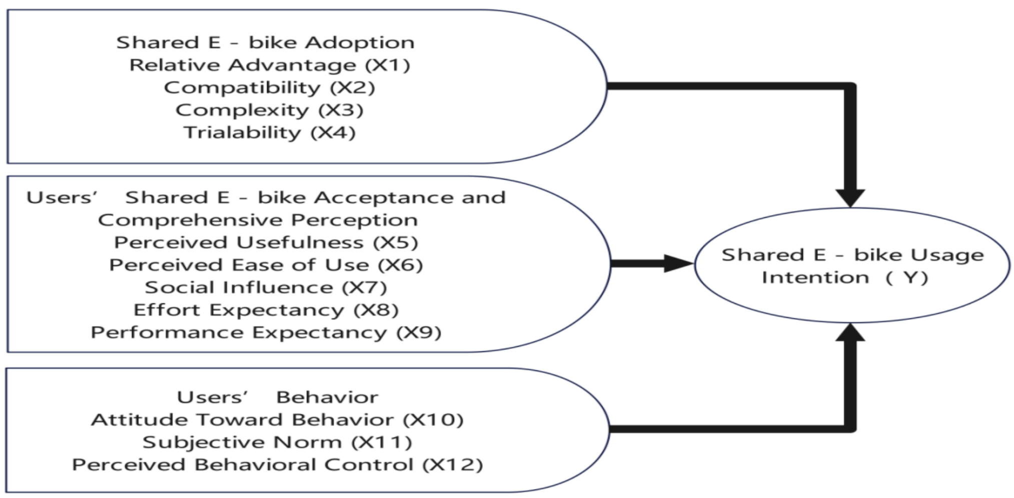

Figure 1 Conceptual Framework of the Study

Note: The framework integrates core dimensions of the Diffusion of Innovations Theory, TAM, UTAUT, and TPB to establish the relationship path between independent variables and the dependent variable.

Research Methodology

Population and Sample

Population: College students who use shared electric bikes at 5 higher education institutions in Dazu District, Chongqing (Chongqing University of Engineering, Chongqing Vocational College of Resources and Environmental Protection, Chongqing Vocational College of Science and Technology, Chongqing Vocational College of Health, Chongqing Vocational College of Telecommunications).

Sampling Method: The W.G. Cochran formula was used to determine the sample size. With a 95% confidence level and a significance level of 0.5, the calculated sample size was 380.44. To guard against invalid questionnaires, 400 surveys were distributed using Probability Proportional to Size Sampling (PPS).

Sample Size: A total of 391 valid samples were obtained after screening invalid questionnaires. Data Collection: The data collection was conducted from October 1 to October 30, 2025, using a mixed distribution method combining online (via the Wenjuanxing platform) and offline (distributed by designated contacts at each university) approaches. Data quality control measures were implemented, including preventing duplicate responses, random sampling, and verifying the completeness of questionnaires.

Data Analysis Methods:

Descriptive Statistics: Demographic characteristics of respondents were analyzed through frequency and percentage; the distribution characteristics of each research variable were calculated using mean, standard deviation, skewness, and kurtosis to determine whether the data distribution conformed to normality (values of skewness and kurtosis between -3 and 3 were considered approximately normally distributed).

Multiple Regression Analysis (MRA): A multiple regression model was constructed with willingness to use as the dependent variable and 12 dimensions of independent variables to explore the intensity and direction of the impact of each factor on behavioral intention. Hypothesis testing for regression analysis premises was performed, including tests for error normality, homoscedasticity, autocorrelation, and multicollinearity.

Research Results

Table 1 Demographic Characteristics of Sample Users (N=391)

Characteristic	Category	Frequency	Percentage (%)
Gender	1）Male	321	82.1
	2）Female	70	17.9
University	1）Chongqing University of Technology and Engineering	58	15.3
	2）Chongqing Vocational College of Resources and Environmental Protection	105	27.9
	3）Chongqing Vocational College of Science and Technology	126	33.2
	4）Chongqing Vocational College of Health	57	15.3
	5）Chongqing Vocational College of Telecommunications	30	8.2
Grade	1）Freshman	145	38.6
	2)Sophomore	101	26.6
	3)Junior	86	22.5
	4)Senior	44	12.3
Monthly living expenses	1）1000 yuan and below	84	23.3
	2）1000-1500 yuan	162	42.7
	3）1501-2000 yuan	70	17.9
	4）2001-3000 yuan	25	6.4
	5）Above 3000 yuan	35	9.7

The analysis of the four dimensions of diffusion of innovation factors showed that the respondents had the highest recognition of "Relative Advantage" (Mean = 4.01), followed by "Compatibility" (3.95), "Complexity" (3.88), and "Trialability" (3.61). All skewness and kurtosis indices were between -3 and 3, showing an approximately normal distribution. The overall mean value was 3.86, indicating that college students had an overall highly positive perception of the core innovation diffusion characteristics of shared electric bicycles.

Table 2 Mean, S.D., Skewness, and Kurtosis of Diffusion Innovation Factors

Diffusion Innovation Factors	Evaluation				
	Mean(μ)	Standard Deviation(σ)	Skewness	Kurtosis	Level Definition
1.Relative Advantage	4.01	0.70	-0.29	-0.74	High
2.Compatibility	3.95	0.79	-0.23	-0.93	High
3.Complexity	3.88	0.79	-0.43	-0.12	High
4.Trialability	3.61	0.86	-0.22	-0.17	High
Total	3.86	0.79	-0.30	-0.49	High

The analysis of the five dimensions of technology acceptance and utilization factors showed that "Perceived Usefulness" had the highest mean value (3.93), followed by "Performance Expectancy" (3.87), "Social Influence" (3.51), "Effort Expectancy" (3.21), and "Perceived Ease of Use" (2.89). The overall mean value was 3.48, indicating a positive impact on college students' willingness to use.

Table 3 Mean, S.D., Skewness, and Kurtosis of Technology Acceptance and Utilization Factors

Technology Acceptance and Utilization Factors	Evaluation				
	μ	σ	Skewness	Kurtosis	Level Definition
1.Perceived Usefulness	3.93	0.81	-0.49	0.19	High
2.Perceived Ease of Use	2.89	0.60	0.13	-0.39	Medium
3.Social Influence	3.51	0.45	-0.17	1.22	High
4.Effort Expectancy	3.21	0.59	-0.64	0.86	Medium
5.Performance Expectancy	3.87	0.81	-0.32	-0.28	High
Total	3.48	0.65	-0.28	0.30	High

The analysis of the three dimensions of planned behavior factors showed that "Attitude Toward Behavior" had a mean value of 3.84, "Perceived Behavioral Control" 3.80, and "Subjective Norm" 2.83. The overall mean value was 3.49, indicating a positive impact on college students' willingness to use.

Table 4 Mean, S.D., Skewness, and Kurtosis of Planned Behavior Factors

Planned Behavior Factors	Evaluation				
	μ	σ	Skewness	Kurtosis	Level Definition
1.Attitude Toward Behavior	3.84	0.78	-0.31	-0.30	High
2.Subjective Norm	2.83	0.62	-0.63	0.40	Medium
3.Perceived Behavioral Control	3.80	0.80	-0.13	-0.97	High
Total	3.49	0.73	-0.36	-0.29	High

Table 5 Summary of Research Results

Model	R	R^2	Durbin-Watson	Std. Errorof the estimate
1	.836	.698	2.00	0.462

Table 6 ANOVA result of the research

Model	Sum of Squares	df	Mean Square	F	sig
Regression	186.826	12	15.569	72.928	.000
Residual	80.696	378	0.213		
Total	267.522	390			

Table 7 Regression Coefficients and Significance Analysis

Independent Variables	Unstandardized CoefficientsBeta	S.E.B	Standardized Coefficients Beta	t	P-value (*Sig.*)
	B	SE_b	βi		
Constant	-0.71	0.245		-2.899	0.004
Relative Advantage(X1)	0.028	0.054	0.024	0.526	0.6
Compatibility(X2)	0.173	0.054	0.165	3.207	0.001*
Complexity(X3)	-0.001	0.056	-0.001	-0.023	0.982
Trialability(X4)	0.119	0.045	0.124	2.674	0.008*
Perceived Usefulness (X5)	0.081	0.061	0.079	1.326	0.186
Perceived Ease of Use (X6)	0.074	0.042	0.054	1.775	0.077
Social Expectation(X7)	0.028	0.053	0.015	0.53	0.596
Effort Expectancy(X8)	0.158	0.046	0.113	3.445	0.001*
Performance Expectancy(X9)	0.192	0.056	0.188	3.416	0.001*
Attitude Toward Behavior (X10)	0.035	0.059	0.033	0.594	0.553
Subjective Norm (X11)	0.057	0.04	0.042	1.414	0.158
Perceived Behavioral Control (X12)	0.264	0.05	0.254	5.26	0.000*

Notice: *is statistically significant at 0.05 level, $p<0.05$

The five key dimensions (Compatibility, Trialability, Effort Expectancy, Performance Expectancy, and Perceived Behavioral Control) were significantly positively correlated with the willingness to use shared electric bicycles ($p < 0.05$), while the other seven dimensions showed no statistically significant correlation with the usage willingness.

The adjusted R^2 value was 0.698, indicating that the independent variables could explain approximately 69.8% of the variation in the dependent variable. The Durbin-Watson value was 2.00, meeting the conditions for multiple regression analysis. The F-test result was significant ($p = 0.000$), indicating that the regression model was valid.

Regression Coefficients and Significance Analysis: Compatibility (X2), Trialability (X4), Effort Expectancy (X8), Performance Expectancy (X9), and Perceived Behavioral Control (X12) had statistically significant effects on shared e-bike usage intention ($p < 0.05$).

The regression equation was:

$$Y = -0.710 + 0.165X_2 + 0.124X_4 + 0.113X_8 + 0.188X_9 + 0.254X_{12}.$$

The hypothesis testing results showed that H2, H4, H8, H9, and H12 were supported, while the other hypotheses were not supported.

Summary of the Study

This study explored the influencing factors of college students' willingness to use shared electric bicycles in Dazu District, Chongqing, by integrating four theoretical frameworks. The empirical results showed that planned behavior factors, UTAUT core dimensions, and innovation diffusion characteristics jointly exerted a significant positive impact on usage intention. Perceived behavioral control was the most influential factor, followed by performance expectancy, compatibility, trialability, and effort expectancy.

The four theoretical frameworks formed a complementary explanatory system: the Diffusion of Innovations Theory explained the diffusion mechanism through compatibility and trialability; the integrated TAM-UTAUT framework revealed the core logic of technology acceptance through performance expectancy and effort expectancy; the Theory of Planned Behavior clarified the basis of behavioral decision-making through perceived behavioral control.

The research conclusions can provide empirical references for shared electric bicycle operators to optimize their service strategies in university areas. Future research can further expand the research scope, enrich research variables, innovate research methods, and extend research objects to improve related field studies.

Discussions

User Analysis Under the Diffusion of Innovations Theory

Compatibility and trialability emerged as significant predictive variables, which aligns with both Rogers' (1962) Diffusion of Innovations Theory and recent empirical findings in shared mobility research. Bokolo (2023) confirmed that compatibility with daily scenarios is a key driver of shared e-mobility adoption in smart communities, which echoes our result that "technology-user habit fit" and "product-scenario demand fit" jointly promote diffusion among college students. Regarding trialability, our finding that low-cost trials are critical for cost-sensitive student groups (23.3% with monthly living expenses ≤1,000 yuan) is consistent with Zhu et al. (2025), who found that free experiences and student discounts effectively reduce adoption barriers for young users. However, unlike Ibrahim et al. (2022), who reported that observability (a core dimension of DOI) significantly impacts university students' bicycle use intention, observability was not included in our final model—this discrepancy may stem from the mountainous terrain context, where practical performance (e.g., uphill power) is more salient than social visibility of usage. Additionally, relative advantage (Mean=4.01) and complexity did not reach statistical significance, which may be because shared e-bikes have become a mature travel tool in campus scenarios: their "time-saving and labor-saving" advantages are universally recognized (thus no longer a differentiated factor), and the operation process (e.g., APP unlocking, payment) has been simplified to a basic standard, making complexity irrelevant to usage decisions.

User Analysis Under the Integrated TAM-UTAUT Framework

Performance expectancy and effort expectancy were identified as key driving factors, which is consistent with the UTAUT framework (Venkatesh et al., 2003) and empirical evidence from shared transportation research. Khan et al. (2025) found that performance expectancy (e.g., punctuality, comfort) is the most influential UTAUT dimension for university students' shared e-bike use intention, which supports our result that battery life and ergonomic design (core components of performance expectancy) address mountainous riding pain points. Regarding effort expectancy, our finding that it includes both operational and service effort (e.g., after-sales efficiency, guide clarity) extends Venkatesh & Davis' (2000) original construct and aligns with Duan et al. (2023), who reported that service-related costs (e.g., complaint response speed) significantly impact shared mobility user retention.

Notably, two UTAUT/TAM dimensions—Social Influence and Perceived Ease of Use—were non-significant. For social influence (Mean=3.51), the non-significance may be attributed to the autonomous decision-making characteristics of college students: as young adults, they have formed independent travel preferences and are less likely to be influenced by peers, family, or social norms when choosing travel tools (Xia, 2022). In mountainous travel scenarios, where functional needs (e.g., uphill capability) are critical, social approval or group behavior has a negligible impact compared to practical value. For perceived ease of use (Mean=2.89), unlike Zhu et al. (2025)'s finding in plain cities, it did not enter the final model—this highlights the terrain constraint effect: students are willing to tolerate minor operational inconveniences (e.g., APP positioning deviations) to meet their core need for labor-saving uphill travel, making functional performance more important than operational simplicity.

User Analysis Under the Theory of Planned Behavior

Perceived behavioral control (PBC) emerged as the most influential factor (β=0.254), which aligns with Ajzen's (2020) TPB proposition and empirical findings in constrained travel contexts. Ji et al. (2021) found that PBC (e.g., vehicle availability, operational feasibility) is the core predictor of shared bike use intention in mountainous cities like Lanzhou, which supports our result that resource accessibility and uphill riding adaptability shape students' control perceptions.

However, Subjective Norm (Mean=2.83) was non-significant, which differs from Chen et al. (2022)'s report of moderate social influence in plain areas. This discrepancy, combined with the non-significance of social influence (UTAUT), further confirms that college students' travel decisions in mountainous contexts are dominated by pragmatic considerations rather than social approval. As Xia (2022) noted, Chinese college students exhibit "pragmatic decision-making" when facing functional demands: in mountainous travel, where efficiency and physical effort are key concerns, they prioritize practical value (e.g., cost, uphill performance) over the opinions of others. Additionally, attitude toward behavior (Mean=3.84) was non-significant due to high consistency—over 90% of students held positive attitudes toward shared e-bikes, which is common in mature innovation adoption scenarios (Rogers, 1962) where core user needs are fully met.

Recommendations

Optimize Perceived Behavioral Control Based on TPB: Guided by the core proposition of the Theory of Planned Behavior (Ajzen, 2020) that "behavioral controllability determines intention", operators should optimize resource allocation and cost control to enhance students' sense of control. For example, adopt demand-driven vehicle deployment strategies based on travel peak data (e.g., off-campus shopping and class hours) to ensure resource accessibility; design price mechanisms compatible with the consumption capacity of young groups (42.7% with monthly living expenses of 1,000-1,500 yuan), such as academic-period pricing packages or freshman adaptation subsidies.

Enhance Performance Expectancy in Mountainous Scenarios: In line with the UTAUT theory's emphasis on "performance outcomes as core drivers" (Venkatesh et al., 2003), product design should prioritize terrain adaptability. Key improvements include optimizing battery life to address uphill power shortage risks, enhancing riding comfort through ergonomic design, and improving information transparency (e.g., real-time power display) to reduce uncertainty in mountainous travel.

Strengthen Compatibility: Increase vehicle deployment during peak hours such as morning and evening classes and weekends; optimize the APP unlocking process to support one-click login; cooperate with business districts and public transport companies to set up exclusive parking spots to improve the connection efficiency of the "last kilometer".

Facilitate Trialability Based on Diffusion of Innovations Theory: Following Rogers' (1962) view that "low-risk trials accelerate innovation diffusion", operators should reduce adoption barriers for cost-sensitive student groups (23.3% with monthly living expenses ≤1,000 yuan). Feasible approaches include implementing risk-free trial mechanisms (e.g., no-cost initial rides, fault-free refunds) and exclusive preferential policies linked to student identity authentication, which align with the "low-cost access" characteristic of trialability in youth groups.

Reduce Effort Expectancy Through Service Optimization: Extending the UTAUT framework's connotation of effort expectancy (Venkatesh & Davis, 2000), which includes both operational and service effort, operators should improve service efficiency and user guidance. This involves building a multi-channel after-sales response system with clear time limits, and developing scenario-specific user guides (e.g., video tutorials for mountain riding) to reduce cognitive and operational costs.

Application Recommendations of the Research Results

Universities can cooperate with operators to set up exclusive parking areas and charging stations for shared electric bicycles on campus, standardize vehicle parking order, and incorporate riding safety education into freshmen orientation. Management departments can promote operators to establish campus service standards, clarify requirements such as after-sales response time and vehicle maintenance cycles, and coordinate the coordinated development of shared electric bicycles with campus transportation and urban short-distance transportation to improve the green travel system.

Future Research Directions

Deepen Gender-Specific Analysis: Conduct comparative research on male and female students' travel behavior and demand characteristics, focusing on differences in safety requirements, price sensitivity, and usage scenarios, to provide targeted optimization suggestions for operators and management departments.

Expand Research Scope and Sample Representativeness: Extend samples to universities in different terrains (plains, hills, mountains) and city tiers (first-tier cities, districts, and counties) across Chongqing and even the whole country, incorporate more female samples (currently only 17.9%), and verify the generalizability of research conclusions.

Enrich Research Variables: Introduce variables not included such as "vehicle safety", "brand trust", "competitor substitution effect" (e.g., shared scooters and ride-hailing services), and "campus policy support" to construct a more comprehensive influencing factor model.

Innovate Research Methods and Data Sources: Add qualitative methods such as in-depth interviews and focus groups on the basis of quantitative research to explore students' deep-seated needs and pain points regarding product design and service quality; conduct a 6-12 month longitudinal tracking study on the same group of users to analyze the dynamic changes of usage willingness with usage frequency and experience feedback; combine APP backend data (riding routes, usage duration, fault feedback) with questionnaire data to reduce subjective bias and improve research accuracy.

References

Ajzen, I. (1985). Action control: From cognition to behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11-40). Springer. https://doi.org/10.1007/978-3-642-69746-3_12

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Journal of Behavioral Decision Making,* 33(2), 261-273. https://doi.org/10.1002/hbe2.195

Bokolo, A. J. (2023). Examining the adoption of sustainable eMobility-sharing in smart communities: Diffusion of innovation theory perspective. *Sustainability,* 6(4), 95. https://doi.org/10.3390/su6040095

Chen, X. F., Liu, Y., & Zhang, J. (2022). Predicting college students' bike-sharing intentions based on the theory of planned behavior. *Frontiers in Psychology,* 13, 836983. https://doi.org/10.3389/fpsyg.2022.836983

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly,* 13(3), 319-340. https://doi.org/10.2307/249008

Duan, Y., Wang, J., Li, H., Yan, Y., & Zhang, X. (2023). A comparison in travel characteristics of bike-sharing between college students and office workers based on theory of planned behavior. *Behavioral Sciences,* 13(4), 329. https://doi.org/10.3390/bs13040329

Enkel, E., & Wintgens, S. (2025). Understanding mass-market electric vehicle adoption: Integrating diffusion of innovation theory with risk mitigation strategy in Germany. *Technovation,* 118, 102897. https://doi.org/10.1016/j.technovation.2024.102897

Huang, Z. M. Q. (2024). *Analysis on the characteristics and influencing mechanism of college students' travel behavior under the "Dual Carbon" strategy* [Master's thesis]. East China Jiaotong University. https://doi.org/10.27147/d.cnki.ghdju.2024.000168

Ibrahim, A. N. H., Borhan, M. N., Darus, N. S., & Mhd Yunin, N. A. (2022). Understanding the willingness of students to use bicycles for sustainable commuting in a university setting: A structural equation modelling approach. *Mathematics,* 10(6), 861. https://doi.org/10.3390/math10060861

Ismail, F. K. M., Abdullah, J., & Ahmad, N. (2022). Item objective congruence (IOC) index: A systematic review. *Journal of Education and Learning,* 11(2), 123-132. https://doi.org/10.5539/jel.v11n2p123

Ji, W., Lu, C., Mao, J., Liu, Y., Hou, M., & Pan, X. (2021). Public's intention and influencing factors of dockless bike-sharing in central urban areas: A case study of Lanzhou City, China. *Sustainability,* 13(16), 9265. https://doi.org/10.3390/su13169265

Khan, M. A., Salleh, N. M., & Ahmad, N. (2025). Factors influencing intention usage of ride-hailing applications in higher education institution: Integrating UTAUT and extended technology acceptance model. *IEOM Society International Proceedings,* 176, 827-834. https://ieomsociety.org/proceedings/singapore2025/176.pdf

Rogers, E. M. (1962). *Diffusion of innovations* (3rd ed.). Free Press.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly,* 27(3), 425-478. https://doi.org/10.2307/30036540

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science,* 46(2), 186-204. https://doi.org/10.1287/mnsc.46.2.186.11926

Xia, N. (2022). *A study on the impact of social orientation on green consumption behavior* [Master's thesis]. Wuhan University of Technology. https://doi.org/10.27381/d.cnki.gwlgu.2022.001880

Zhu, X., Lyu, D., Xu, J., & Lin, Y. (2025). Travel characteristics and cost–benefit analysis of bike share service on university campuses. *Sustainability,* 17(8), 3489. https://doi.org/10.3390/su17083489