Consumer Intentions to Use Low-Altitude Logistics Delivery Services

An Empirical Analysis Based on UTAUT2

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Abstract. Low-altitude logistics delivery links unmanned aerial vehicle operations with last-mile distribution, yet its diffusion ultimately depends on consumer acceptance. Drawing on UTAUT2, this study examines how performance expectancy and price value shape residents' intentions to use such services and whether perceived risk creates heterogeneous effects. Survey data from 317 Liaoning residents were analysed using reliability, factor, correlation, regression, and risk-group comparison procedures. Both performance expectancy ($\beta = 0.677$, $p < 0.01$) and price value ($\beta = 0.790$, $p < 0.01$) positively predict intention, with price value exerting the larger effect. The performance-expectancy effect is stronger under low perceived risk, whereas the price-value effect is stronger under high perceived risk. The findings indicate that visible delivery performance, transparent pricing, and end-to-end risk governance should be developed jointly to encourage adoption.

Keywords: low-altitude logistics delivery; consumer intention; UTAUT2; performance expectancy; price value; perceived risk

1 Introduction

Low-altitude logistics delivery is a consumer-facing application of the low-altitude economy. By integrating UAV operations with last-mile distribution, it can shorten routes and improve response speed, but flight safety, service stability, privacy, and goods-loss concerns may constrain routine use. Its performance therefore depends on coordinated airspace infrastructure, routing, communications, and operational resilience [1, 2, 3, 4, 5, 6, 7, 8, 9, 10].

Prior work has largely addressed supply networks, infrastructure, or operational optimization. Evidence on residents as end users remains limited. This study uses Liaoning as a setting to examine whether perceived usefulness and price value lead to usage intention and whether perceived risk changes these relationships. It contributes a demand-side UTAUT2 model for an emerging logistics service.

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2 Theoretical Background and Hypotheses

UTAUT2 explains consumer acceptance by linking expected benefits and value assessments with behavioral intention. Its use should be context-sensitive rather than mechanically exhaustive [11, 12, 13]. In low-altitude delivery, performance expectancy reflects expected timeliness, convenience, and usefulness. When these benefits are visible through reliable service and tracking, they should translate into willingness to use the service [4, 7]. Accordingly, H1 states: Performance expectancy positively affects behavioral intention to use low-altitude logistics delivery services.

Price value captures the trade-off between perceived service benefits and monetary costs. A novel delivery option can create convenience and differentiation, but consumers will adopt it only when the experience appears worth the price [12, 13]. Transparent charges, operational reliability, and recovery arrangements are particularly important for this judgment [3, 14]. Accordingly, H2 states: Price value positively affects behavioral intention to use low-altitude logistics delivery services.

Perceived risk covers uncertainty regarding flight safety, privacy, goods damage, and service instability. Risk-control capability is central to urban low-altitude logistics [14, 15, 16]. At lower risk, expected performance can be more readily converted into intention; H3a therefore predicts a stronger performance-expectancy effect in the low-risk group. Under higher risk, service assurance, compensation, and price rules become more salient to value judgments; H3b predicts a stronger price-value effect in the high-risk group.

Behavioral intention is the dependent variable; performance expectancy and price value are focal predictors; perceived risk provides the boundary condition; and gender, age, education, monthly income, and residential area type are controls. The overall research model is illustrated in Fig. 1.

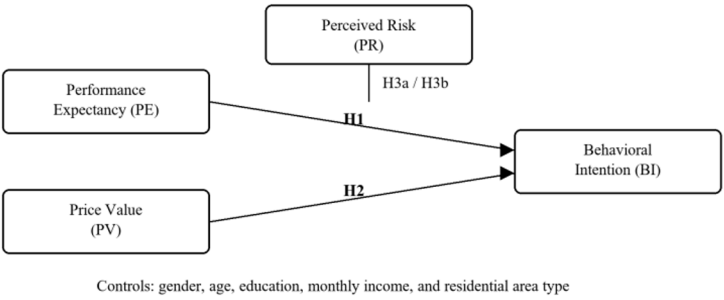


Fig. 1. Research model.

3 Research Design

The study uses back-end data from the Liaoning Province Low-Altitude Logistics Delivery Survey. After screening, 317 valid questionnaires were retained. All core constructs were measured on five-point Likert scales, and construct scores were calculated

as item means. Performance expectancy covered faster receipt, convenience, and usefulness; price value covered perceived worth and value for money; perceived risk covered safety, loss or damage, privacy, and stability; and behavioral intention covered future use, recommendation, and regular use.

SPSS was used for descriptive statistics, internal-consistency reliability, exploratory factor analysis, Pearson correlation, regression, and perceived-risk group comparisons. The mean risk score of 4.00 divided respondents into low-risk (PR ≤ 4.00) and high-risk (PR > 4.00) groups. This comparison tests the hypothesized differentiated pattern; a formal interaction analysis would require a separate interaction-term regression.

4 Results

The sample is predominantly female (73.2%), aged 18–25 years (77.9%), educated to bachelor's degree level (77.3%), with monthly income below RMB 3,000 (65.9%), and resident in urban core areas (76.0%). The composition should therefore be considered when generalizing the results.

Measurement quality is satisfactory, as shown in Table 1. All Cronbach's α values exceed 0.90, factor loadings range from 0.683 to 0.878, the KMO statistic is 0.926, and Bartlett's test is significant ($\chi^2 = 4{,}218.110$, df = 78, $p < 0.001$).

Table 1. Measurement Quality

Construct	Items	Cronbach's α	Factor-loading range
Performance expectancy	3	0.944	0.823–0.847
Price value	3	0.915	0.683–0.774
Perceived risk	4	0.937	0.850–0.878
Behavioral intention	3	0.926	0.739–0.823

Note: KMO = 0.926; Bartlett's test: $\chi^2 = 4{,}218.110$, df = 78, $p < 0.001$.

Table 2 reports means, standard deviations, and correlations. Performance expectancy, price value, and behavioral intention are positively correlated. The correlation evidence is directionally consistent with the proposed model but does not substitute for the controlled regression tests.

Table 2. Descriptive Statistics and Correlations

Variable	Mean	SD	1	2	3	4
1. PE	4.276	0.769	1			
2. PV	3.963	0.813	0.706***	1		
3. PR	3.910	0.896	0.524***	0.581***	1	
4. BI	3.992	0.792	0.698***	0.807***	0.508***	1

*Note: PE = performance expectancy; PV = price value; PR = perceived risk; BI = behavioral intention. N = 317. *** p < 0.01.*

The main-effect regression results are presented in Table 3. After controlling for demographics, performance expectancy positively predicts behavioral intention ($\beta = 0.677$, $p < 0.01$), supporting H1. Price value also positively predicts intention ($\beta = 0.790$, $p < 0.01$), supporting H2. The price-value model explains more variance ($R^2 = 0.660$) than the performance-expectancy model ($R^2 = 0.529$); VIF values remain below 2 and D–W values are close to 2.

Table 3. Main-Effect Regression Results

Predictor / fit index	M1: Performance expectancy	M2: Price value
Performance expectancy	0.677***	—
Price value	—	0.790***
Controls	Included	Included
F	57.913***	100.510***
R^2 / adjusted R^2	0.529 / 0.519	0.660 / 0.654
VIFmax / D–W	1.872 / 1.877	1.909 / 1.976

*Note: Entries for focal predictors are standardized regression coefficients (β). *** p < 0.01.*

The comparison results for the low- and high-perceived-risk groups are summarized in Table 4. Risk-group comparisons support both conditional hypotheses. The performance-expectancy coefficient declines from 0.323 in the low-risk group to 0.156 in the high-risk group, supporting H3a. In contrast, the price-value coefficient increases from 0.452 to 0.708, supporting H3b.

Table 4. Perceived-Risk Group Comparisons

Hypothesis / predictor	Low-risk β	High-risk β	Result
H3a: Performance expectancy	0.323***	0.156*	Supported
H3b: Price value	0.452***	0.708***	Supported
R^2	0.596	0.673	
D–W	1.865	2.121	

*Note: Both models control for gender, age, education, monthly income, and residential area type. * p < 0.10; *** p < 0.01.*

5 Discussion and Implications

The results show that residents' adoption decisions depend on both operational value and economic value. Price value is the stronger predictor, indicating that a service cannot rely on technological novelty alone: residents assess whether the delivery experience is commensurate with payment. The risk-group findings further show that safety and reliability concerns weaken the conversion of expected performance into intention,

whereas transparent value arrangements become especially influential under higher risk.

Operators should prioritize standardized, time-sensitive scenarios such as emergency medicine, instant retail, and scheduled campus or community delivery. Estimated arrival times, real-time locations, and exception alerts can make performance benefits visible. Route planning should be aligned with demand, weather, communications, and ground-transfer conditions [7, 8, 10].

Providers should pair differentiated service options with explicit charges, compensation rules, privacy protection, and flight-safety procedures. Transparent trial offers and comparison with conventional delivery can support value formation. Risk governance should also incorporate routing, communications assurance, and emergency planning [16].

6 Conclusion

Using a UTAUT2-based survey of 317 Liaoning residents, this study finds that performance expectancy and price value positively predict intention to use low-altitude logistics delivery services. Perceived risk differentiates these effects: performance expectancy matters more at lower risk, while price value matters more at higher risk. The study provides demand-side evidence for the rollout of low-altitude logistics services.

The study is geographically limited to Liaoning and evaluates behavioral intention rather than actual use. Future research should employ cross-regional and longitudinal data, trial or platform records, and formal interaction analysis to test whether usage patterns vary by demographic characteristics, delivery scenarios, and risk-assurance arrangements. Connections with the Physical Internet and collaborative vehicle–drone delivery also merit attention [17, 18].

References

1. Huang, H., Su, J., Wang, F.Y.: The potential of low-altitude airspace: The future of urban air transportation. IEEE Transactions on Intelligent Vehicles 9(8), 5250–5254 (2024).
2. Wang, Y., Sun, G., Sun, Z., et al.: Toward realization of low-altitude economy networks: Core architecture, integrated technologies, and future directions. IEEE Transactions on Cognitive Communications and Networking (2025).
3. Jingshuai, Y., Haofeng, X.: A comprehensive review of building the resilience of low-altitude logistics: Key issues, challenges, and strategies. Sustainability 18(1), 461 (2026)
4. Li, Z., Li, S., Lu, J., et al.: Air route network planning method of urban low-altitude logistics UAV with double-layer structure. Drones 9(3), 193 (2025).
5. Zhang, R., Zhang, K., Hao, Y.: Key influencing factors and structural analysis of the coordinated development between the low-altitude economy and sustainable modern logistics. Sustainability 18(8), 3758 (2026).
6. Liao, X., Xu, C., Ye, H.: Benefits and challenges of constructing low-altitude air route network infrastructure for developing low-altitude economy. Bulletin of Chinese Academy of Sciences 39(11), 1966–1981 (2024).

7. Deng, M., Yang, Q., Peng, Y.: A real-time path planning method for urban low-altitude logistics UAVs. Sensors 23(17), 7472 (2023).
8. Zhang, H., Wu, S., Feng, O., et al.: Research on demand-based scheduling scheme of urban low-altitude logistics UAVs. Applied Sciences 13(9), 5370 (2023).
9. Yi, J., Zhang, H., Wang, F., et al.: An operational capacity assessment method for an urban low-altitude UAV logistics route network. Drones 7(9), 582 (2023).
10. Ruiyang, D., Yinian, M., Jialong, C., et al.: Communications in urban low-altitude drone logistics networks: Requirements, solutions and challenges. China Communications 22(9), 37–47 (2025).
11. Chang, A.: UTAUT and UTAUT2: A review and agenda for future research. Journal of the WINNERS 13(2), 10–114 (2012).
12. Tamilmani, K., Rana, N.P., Dwivedi, Y.K.: A systematic review of citations of UTAUT2 article and its usage trends. In: Conference on e-Business, e-Services and e-Society, pp. 38–49. Springer (2017).
13. Tamilmani, K., Rana, N.P., Dwivedi, Y.K.: Consumer acceptance and use of information technology: A meta-analytic evaluation of UTAUT2. Information Systems Frontiers 23(4), 987–1005 (2021).
14. Nakamura, H.: Optimization of urban low-altitude logistics network and risk control: A perspective of smart city integration. Journal of Low-Altitude Economy and Air Mobility 1(1), 61–80 (2025).
15. Yamamoto, T.: Safety risk management and path optimization of urban low-altitude logistics distribution: A system dynamics perspective. Journal of Low-Altitude Economy and Air Mobility 1(1), 29–44 (2025).
16. Feng, O., Zhang, H., Wang, F., et al.: A method for orderly and parallel planning of public route networks for logistics based on urban low-altitude digital airspace environment risks. Drones 9(9), 634 (2025).
17. Pan, S.: Low-altitude logistics with physical internet. In: International Congress on Logistics and Supply Chain Management Systems, pp. 87–98. Springer (2025).
18. Li, Z.X., Xin, B., Wang, Q., et al.: Operational optimization in low-altitude economy: Integrated model and algorithm for collaborative vehicle-drone delivery. Unmanned Systems, 1–20 (2026).

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