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Determinants of Customer Satisfaction in Pos Kilat Khusus Services at PT Pos Indonesia Bengkulu Main Branch through Last Mile Delivery Performance

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Abstract: This study examines the effects of Packaging, Pickup Service, and Transportation on Customer Satisfaction through Last Mile Delivery Performance at PT Pos Indonesia Bengkulu Main Branch. A quantitative approach employing Structural Equation Modeling–Partial Least Squares (SEM-PLS) was adopted. Data were collected from 119 customers selected using purposive sampling. The findings reveal that Packaging positively affects Last Mile Delivery Performance ($\beta = 0.310$, $t = 4.200$, $p < 0.001$) and Customer Satisfaction ($\beta = 0.283$, $t = 3.843$, $p < 0.001$). Pickup Service positively influences Last Mile Delivery Performance ($\beta = 0.262$, $t = 3.273$, $p = 0.001$) and Customer Satisfaction ($\beta = 0.205$, $t = 2.627$, $p = 0.009$). Transportation also has significant positive effects on Last Mile Delivery Performance ($\beta = 0.258$, $t = 4.059$, $p < 0.001$) and Customer Satisfaction ($\beta = 0.197$, $t = 2.854$, $p = 0.004$). Furthermore, Last Mile Delivery Performance significantly affects Customer Satisfaction ($\beta = 0.294$, $t = 3.731$, $p < 0.001$) and partially mediates the effects of Packaging ($\beta = 0.091$, $t = 2.411$, $p = 0.016$), Pickup Service ($\beta = 0.077$, $t = 2.608$, $p = 0.009$), and Transportation ($\beta = 0.076$, $t = 2.726$, $p = 0.007$) on Customer Satisfaction. These findings highlight the strategic role of integrated logistics operations in enhancing customer satisfaction.

Keyword: Packaging, Pickup Service, Transportation, Last Mile Delivery Performance, Customer Satisfaction.

Indonesian Abstract: Penelitian ini mengkaji pengaruh Pengemasan, Layanan Penjemputan, dan Transportasi terhadap Kepuasan Pelanggan melalui Kinerja Pengiriman Mil Akhir pada PT Pos Indonesia Kantor Cabang Utama Bengkulu. Penelitian ini menggunakan pendekatan kuantitatif dengan metode Structural Equation Modeling–Partial Least Squares (SEM-PLS). Data dikumpulkan dari 119 pelanggan yang dipilih menggunakan teknik purposive sampling. Hasil penelitian menunjukkan bahwa Pengemasan berpengaruh positif terhadap Kinerja Pengiriman Mil Akhir ($\beta = 0,310$; $t = 4,200$; $p < 0,001$) dan Kepuasan Pelanggan ($\beta = 0,283$; $t = 3,843$; $p < 0,001$). Layanan Penjemputan berpengaruh positif terhadap Kinerja Pengiriman Mil Akhir ($\beta = 0,262$; $t = 3,273$; $p = 0,001$) dan Kepuasan Pelanggan ($\beta = 0,205$; $t = 2,627$; $p = 0,009$). Transportasi juga memiliki pengaruh positif dan signifikan terhadap

Kinerja Pengiriman Mil Akhir ($\beta = 0,258$; $t = 4,059$; $p < 0,001$) dan *Kepuasan Pelanggan* ($\beta = 0,197$; $t = 2,854$; $p = 0,004$). Selanjutnya, *Kinerja Pengiriman Mil Akhir* berpengaruh signifikan terhadap *Kepuasan Pelanggan* ($\beta = 0,294$; $t = 3,731$; $p < 0,001$) dan secara parsial memediasi pengaruh *Pengemasan* ($\beta = 0,091$; $t = 2,411$; $p = 0,016$), *Layanan Penjemputan* ($\beta = 0,077$; $t = 2,608$; $p = 0,009$), dan *Transportasi* ($\beta = 0,076$; $t = 2,726$; $p = 0,007$) terhadap *Kepuasan Pelanggan*. Temuan ini menegaskan peran strategis integrasi operasi logistik dalam meningkatkan kepuasan pelanggan.

Keywords: *Pengemasan, Layanan Penjemputan, Transportasi, Kinerja Pengiriman Mil Akhir, Kepuasan Pelanggan.*

INTRODUCTION

The rapid growth of the logistics industry has significantly increased customer expectations regarding delivery service quality. Customers no longer expect only the safe arrival of goods but also demand timely delivery, reliability, security, and convenience throughout the shipping process. Consequently, logistics service providers are required to continuously improve their operational performance to maintain customer satisfaction and sustain competitive advantage. Among all logistics activities, last mile delivery has become one of the most critical determinants of service quality because it represents the final interaction between logistics providers and customers. Effective last mile delivery creates a positive customer experience, whereas delays or delivery failures frequently result in dissatisfaction.

As Indonesia's national postal and logistics company, PT Pos Indonesia continuously improves its logistics services through several delivery products, including Pos Kilat Khusus (Special Express Mail Service). This service guarantees an H+2 delivery standard and provides nationwide coverage, including remote regions. The Bengkulu Main Branch plays a strategic role in processing and distributing Pos Kilat Khusus shipments throughout Bengkulu Province. Therefore, all operational activities, including packaging, pickup service, transportation, and final delivery, must be effectively managed to ensure high-quality logistics services and customer satisfaction.

Despite continuous service improvements, the operational performance of Pos Kilat Khusus at the Bengkulu Main Branch has shown several challenges. Company records indicate that revenue declined from IDR 1,592,333,820 in 2024 to IDR 1,215,522,000 in 2025, representing a decrease of IDR 376,811,820 or 23.66%. This decline suggests a deterioration in service performance that may adversely affect customer trust and loyalty. According to Ngcobo, Marimuthu, and Stainbank (2024), declining revenue is frequently associated with reduced service quality, which may influence customers' intentions to continue using logistics services.

Operational issues are further reflected in customer complaint data. During January–December 2025, the Customer Complaint Handling (CCH) system recorded 6,280 complaints, all related to delivery delays. The high number of complaints indicates that the last mile delivery process has not yet achieved the expected level of operational effectiveness, thereby reducing customer satisfaction. Kim and Kwak (2023) argue that customer complaints represent negative evaluations of service performance and constitute an important indicator of service quality. Consequently, improving customer satisfaction requires addressing operational factors that directly influence last mile delivery performance.

Complaint analysis reveals that delivery delays originate from three major logistics activities. Packaging accounted for 1,910 complaints (30.41%), Pickup Service contributed 2,216 complaints (35.29%), and Transportation generated 2,154 complaints (34.30%). These findings indicate that the three operational activities contribute relatively equally to delivery delays. Therefore, improving packaging quality, pickup services, and transportation systems is

expected to enhance last mile delivery performance and ultimately increase customer satisfaction.

Previous empirical studies have consistently identified Packaging, Pickup Service, Transportation, and Last Mile Delivery Performance as important determinants of customer satisfaction. Tejada and Conway (2023) and Muriel et al. (2022) demonstrated that packaging quality positively influences last mile delivery performance. Likewise, Meng et al. (2022), Li (2022), and Dell'Amico et al. (2023) reported significant positive effects of pickup service on delivery performance. Furthermore, Muriel et al. (2022) and Zhu et al. (2023) confirmed that transportation reliability significantly improves last mile delivery performance. Other studies by Vrhovac et al. (2024), Lai et al. (2022), Adriyanti and Sahroni (2023), Putri and Napitupulu (2023), Neto and Vieira (2023), and Muangpan (2022) concluded that improvements in logistics operations significantly enhance customer satisfaction.

However, previous studies have produced inconsistent findings. Vrhovac et al. (2024) and Lai et al. (2022) reported that Last Mile Delivery Performance significantly affects Customer Satisfaction, whereas Kurniawan et al. (2026) and Rosadi et al. (2025) obtained different results. Similar inconsistencies were found regarding the direct effects of Packaging and Transportation on Customer Satisfaction, with some studies reporting significant relationships while others found no significant influence. Moreover, empirical research simultaneously examining Packaging, Pickup Service, and Transportation as antecedents of Customer Satisfaction through Last Mile Delivery Performance remains limited, particularly in the context of PT Pos Indonesia's Pos Kilat Khusus service.

Based on the empirical phenomenon, research gaps, and limitations of previous studies, this research proposes an integrated conceptual model that positions Last Mile Delivery Performance as a mediating variable linking Packaging, Pickup Service, and Transportation to Customer Satisfaction. Unlike previous studies that primarily investigated these relationships separately, this study simultaneously examines both direct and indirect effects using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The findings are expected to contribute to logistics management literature while providing practical recommendations for PT Pos Indonesia to improve the quality of Pos Kilat Khusus services.

The novelty of this study lies in the development of an integrated empirical model that combines Packaging, Pickup Service, and Transportation as determinants of Customer Satisfaction through the mediating role of Last Mile Delivery Performance. Furthermore, this research focuses on the Pos Kilat Khusus service at the Bengkulu Main Branch of PT Pos Indonesia, which operates under an H+2 delivery standard and serves geographically dispersed areas, including remote regions. Consequently, this study provides new empirical evidence for logistics management research, particularly in the Indonesian postal service sector.

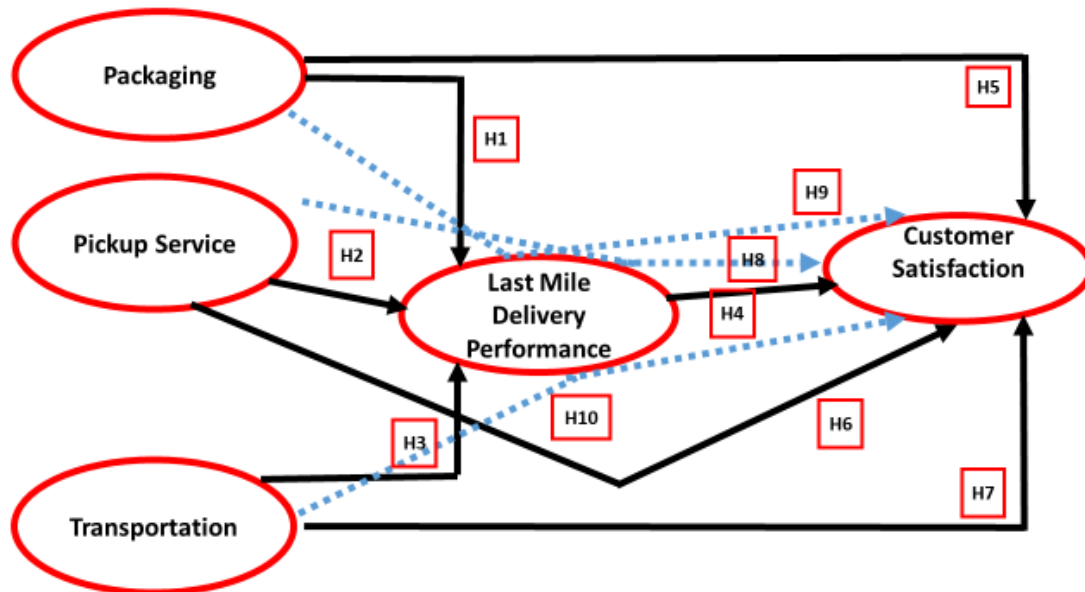
Accordingly, this study aims to empirically examine the direct and indirect effects of Packaging, Pickup Service, and Transportation on Customer Satisfaction through Last Mile Delivery Performance in the Pos Kilat Khusus service of PT Pos Indonesia Bengkulu Main Branch.

METHOD

This study employed a quantitative approach using explanatory research to examine the causal relationships among Packaging, Pickup Service, Transportation, Last Mile Delivery Performance, and Customer Satisfaction through hypothesis testing. A cross-sectional research design was adopted, in which data were collected from respondents at a single point in time. The relationships among the latent variables were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 4 software. SEM-PLS was selected because it enables simultaneous estimation of direct and indirect relationships among latent constructs without requiring multivariate normality and is appropriate for prediction-oriented research.

The research model consisted of three exogenous variables—Packaging, Pickup Service, and Transportation—one mediating variable, namely Last Mile Delivery Performance, and one endogenous variable, Customer Satisfaction. Packaging was measured through three dimensions: product protection, logistics efficiency, and information and sustainability functions. Pickup Service was assessed using ease of pickup, pickup reliability, and pickup efficiency. Transportation comprised transportation mobility, operational efficiency, and transportation sustainability. Last Mile Delivery Performance was measured using delivery timeliness, delivery service quality, and operational efficiency, while Customer Satisfaction was evaluated through expectation confirmation, service performance evaluation, and overall satisfaction.

The proposed conceptual framework is presented in Figure 1.



Source : M.Alhadi Aprizani , 2026

Figure. 1. Research Model

Based on previous theoretical and empirical studies, ten hypotheses were formulated as follows:

H1: Packaging positively affects Last Mile Delivery Performance.

H2: Pickup Service positively affects Last Mile Delivery Performance.

H3: Transportation positively affects Last Mile Delivery Performance.

H4: Last Mile Delivery Performance positively affects Customer Satisfaction.

H5: Packaging positively affects Customer Satisfaction.

H6: Pickup Service positively affects Customer Satisfaction.

H7: Transportation positively affects Customer Satisfaction.

H8: Packaging positively affects Customer Satisfaction through the mediating role of Last Mile Delivery Performance.

H9: Pickup Service positively affects Customer Satisfaction through the mediating role of Last Mile Delivery Performance.

H10: Transportation positively affects Customer Satisfaction through the mediating role of Last Mile Delivery Performance.

Primary data were collected using a structured questionnaire with a five-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree"). The measurement items were developed from established theories and recent empirical studies to ensure content validity. Before structural model evaluation, all measurement indicators were assessed for validity and reliability.

The population comprised customers of Pos Kilat Khusus services at PT Pos Indonesia Bengkulu Main Branch. Since the exact population size was unknown, the sample size was determined using several approaches. According to the 10-times rule proposed by Hair et al. (2022), the minimum sample requirement was 40 respondents because Customer Satisfaction received four structural paths. The G*Power analysis recommended a sample ranging from 85 to 120 respondents, while Hair et al. (2022) suggested that SEM studies generally require between 100 and 200 observations. To obtain a more representative sample, this study employed the Lemeshow formula with a 95% confidence level, a population proportion of 0.50, and a 9% margin of error, resulting in a required sample of 118.51 respondents, which was rounded to 119 respondents. The respondents were selected using purposive sampling based on predefined eligibility criteria.

Data collection involved both primary and secondary sources. Primary data were obtained through direct questionnaire distribution and online surveys using Google Forms. Secondary data were collected from books, scientific journals, conference proceedings, company reports, and other relevant publications. These sources were used to develop the theoretical framework, formulate hypotheses, construct research instruments, and interpret the empirical findings.

Measurement model evaluation (outer model) included assessments of convergent validity, discriminant validity, and construct reliability. Convergent validity was evaluated using outer loadings and Average Variance Extracted (AVE). Indicators with loadings greater than 0.70 and constructs with AVE values above 0.50 were considered acceptable (Hair et al., 2022). Discriminant validity was examined using the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT), where HTMT values below 0.90 indicated adequate discriminant validity. Internal consistency reliability was assessed using Cronbach's Alpha and Composite Reliability, both of which were required to exceed the recommended threshold of 0.70.

The structural model (inner model) was evaluated through bootstrapping procedures by examining path coefficients (β), t-statistics, and p-values. Hypotheses were supported when the t-statistic exceeded 1.96 and the p-value was below 0.05. In addition, the model's explanatory and predictive capabilities were assessed using the coefficient of determination (R^2), effect size (f^2), and predictive relevance (Q^2). The R^2 value measured the proportion of variance explained by the exogenous variables, whereas f^2 evaluated the contribution of each predictor to the endogenous constructs. Predictive relevance was assessed using the blindfolding procedure, with Q^2 values greater than zero indicating satisfactory predictive capability.

RESULTS AND DISCUSSION

Respondent Characteristics

This study involved 119 customers of PT Pos Indonesia Bengkulu Main Branch who had used the Pos Kilat Khusus service. Based on business type, most respondents represented private companies (20.17%), followed by government institutions (19.33%), micro, small, and medium enterprises (16.81%), educational institutions (12.61%), banking and financial institutions (11.76%), state-owned enterprises (10.92%), and hospitals or healthcare providers (8.40%). These findings indicate that the private sector constitutes the largest customer segment because of its relatively high demand for document and parcel delivery services.

Regarding occupation, administrative staff accounted for the largest proportion of respondents (32.77%), followed by unit managers (22.69%), logistics staff (18.49%), courier personnel (15.13%), and business owners (10.92%). Male respondents represented 58.82% of the sample, while females accounted for 41.18%.

Most respondents were between 31 and 40 years old (32.77%), followed by those aged 41–50 years (31.93%), over 50 years (20.17%), and 21–30 years (15.13%). In terms of educational attainment, bachelor's degree holders dominated the sample (49.58%), followed by

diploma graduates (20.17%), while senior high school graduates and postgraduate degree holders each represented 15.13%.

Most respondents reported monthly logistics expenditures ranging from IDR 10 million to IDR 15 million, whereas their monthly expenditure on PT Pos Indonesia services was predominantly between IDR 2 million and IDR 3 million. These characteristics indicate that the respondents were experienced corporate customers who regularly utilized logistics services and were therefore capable of providing reliable evaluations of the research variables.

Measurement Model Assessment

The measurement model was evaluated through convergent validity, discriminant validity, and construct reliability using SmartPLS 4.

The convergent validity assessment demonstrated that all measurement indicators achieved outer loading values above the recommended threshold of 0.70, ranging from 0.701 to 0.861. Likewise, all constructs exhibited Average Variance Extracted (AVE) values exceeding 0.50, namely Customer Satisfaction (0.669), Last Mile Delivery Performance (0.544), Packaging (0.622), Pickup Service (0.601), and Transportation (0.648). These findings confirm satisfactory convergent validity.

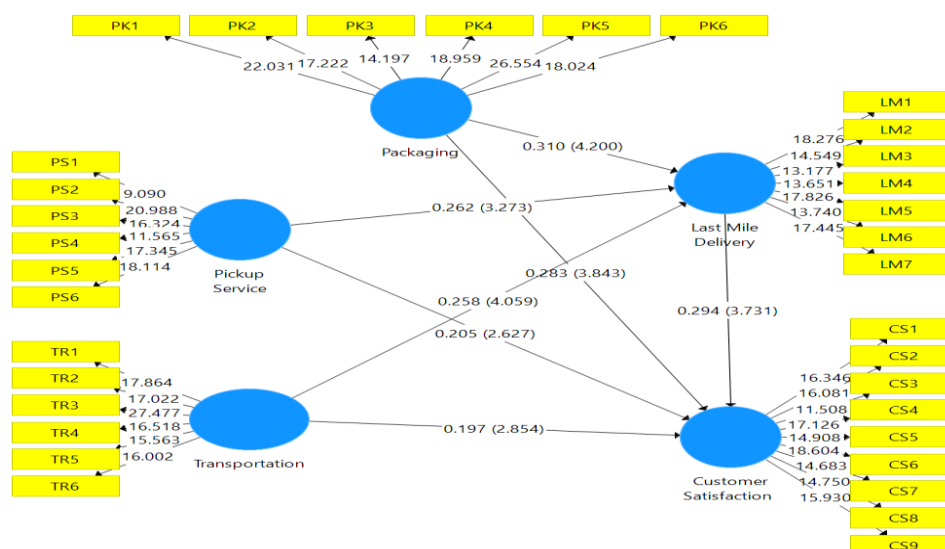
Discriminant validity was assessed using the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT). The square root of the AVE for each construct exceeded its correlations with other constructs, satisfying the Fornell–Larcker criterion. Furthermore, all HTMT values ranged from 0.494 to 0.744, remaining well below the recommended threshold of 0.90. Therefore, all constructs demonstrated adequate discriminant validity.

Construct reliability was evaluated using Cronbach's Alpha and Composite Reliability. Cronbach's Alpha values ranged from 0.860 to 0.938, while Composite Reliability values ranged from 0.893 to 0.948. Since all values exceeded the minimum criterion of 0.70, the constructs were considered internally consistent and reliable. Overall, the measurement model fulfilled all validity and reliability requirements and was therefore suitable for structural model evaluation.

Structural Model Assessment

The structural model was assessed by examining the path coefficients, coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and hypothesis testing results.

The research results obtained using SmartPLS 3 software are presented in Figure 2



Source : Questionnaire (2026)

Figure. 2. Research Result

Hypothesis Testing

The bootstrapping results indicate that all proposed hypotheses were supported because the t-statistics exceeded 1.96 and the corresponding p-values were below 0.05.

Packaging had a significant positive effect on Last Mile Delivery Performance ($\beta = 0.310$, $t = 4.200$, $p < 0.001$) and Customer Satisfaction ($\beta = 0.283$, $t = 3.843$, $p < 0.001$). Similarly, Pickup Service significantly influenced Last Mile Delivery Performance ($\beta = 0.262$, $t = 3.273$, $p = 0.001$) and Customer Satisfaction ($\beta = 0.205$, $t = 2.627$, $p = 0.009$). Transportation also positively affected Last Mile Delivery Performance ($\beta = 0.258$, $t = 4.059$, $p < 0.001$) and Customer Satisfaction ($\beta = 0.197$, $t = 2.854$, $p = 0.004$).

Furthermore, Last Mile Delivery Performance significantly enhanced Customer Satisfaction ($\beta = 0.294$, $t = 3.731$, $p < 0.001$), indicating that improvements in delivery performance during the final distribution stage substantially increase customer satisfaction.

The mediation analysis further demonstrated that Last Mile Delivery Performance partially mediated the effects of Packaging ($\beta = 0.091$, $t = 2.411$, $p = 0.016$), Pickup Service ($\beta = 0.077$, $t = 2.608$, $p = 0.009$), and Transportation ($\beta = 0.076$, $t = 2.726$, $p = 0.007$) on Customer Satisfaction. These findings suggest that improvements in logistics operations contribute more effectively to customer satisfaction when accompanied by superior last mile delivery performance.

Table 1. Structural Model Results

Hypothesis	Relationship	β	t-value	p-value	Decision
H1	Packaging → Last Mile Delivery Performance	0.310	4.200	<0.001	Supported
H2	Pickup Service → Last Mile Delivery Performance	0.262	3.273	0.001	Supported
H3	Transportation → Last Mile Delivery Performance	0.258	4.059	<0.001	Supported
H4	Last Mile Delivery Performance → Customer Satisfaction	0.294	3.731	<0.001	Supported
H5	Packaging → Customer Satisfaction	0.283	3.843	<0.001	Supported
H6	Pickup Service → Customer Satisfaction	0.205	2.627	0.009	Supported
H7	Transportation → Customer Satisfaction	0.197	2.854	0.004	Supported
H8	Packaging → Last Mile Delivery Performance → Customer Satisfaction	0.091	2.411	0.016	Supported
H9	Pickup Service → Last Mile Delivery Performance → Customer Satisfaction	0.077	2.608	0.009	Supported
H10	Transportation → Last Mile Delivery Performance → Customer Satisfaction	0.076	2.726	0.007	Supported

Source : Questionnaire (2026)

The coefficient of determination (R^2) revealed that Customer Satisfaction achieved an R^2 value of 0.634 (Adjusted $R^2 = 0.621$), indicating that approximately 62.1% of its variance was explained by Packaging, Pickup Service, Transportation, and Last Mile Delivery Performance.

Meanwhile, Last Mile Delivery Performance obtained an R^2 value of 0.468 (Adjusted $R^2 = 0.454$), suggesting that Packaging, Pickup Service, and Transportation explained 45.4% of its variance.

The effect size (f^2) values ranged from 0.066 to 0.125, indicating small effect sizes according to Cohen's classification. Although the individual contributions were relatively small, all relationships remained statistically significant.

The predictive relevance analysis yielded Q^2 values of 0.431 for Customer Satisfaction and 0.261 for Last Mile Delivery Performance. Since both values exceeded zero, the proposed model demonstrated satisfactory predictive capability.

CONCLUSION

This study investigated the relationships among Packaging, Pickup Service, Transportation, Last Mile Delivery Performance, and Customer Satisfaction in Pos Kilat Khusus services at PT Pos Indonesia Bengkulu Main Branch using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach.

The empirical findings demonstrate that all proposed hypotheses are supported. Packaging significantly influences Last Mile Delivery Performance ($\beta = 0.310$, $t = 4.200$, $p < 0.001$) and Customer Satisfaction ($\beta = 0.283$, $t = 3.843$, $p < 0.001$). Pickup Service also exerts significant positive effects on Last Mile Delivery Performance ($\beta = 0.262$, $t = 3.273$, $p = 0.001$) and Customer Satisfaction ($\beta = 0.205$, $t = 2.627$, $p = 0.009$). Likewise, Transportation significantly affects Last Mile Delivery Performance ($\beta = 0.258$, $t = 4.059$, $p < 0.001$) and Customer Satisfaction ($\beta = 0.197$, $t = 2.854$, $p = 0.004$). Furthermore, Last Mile Delivery Performance positively influences Customer Satisfaction ($\beta = 0.294$, $t = 3.731$, $p < 0.001$).

The mediation analysis confirms that Last Mile Delivery Performance partially mediates the relationships between Packaging ($\beta = 0.091$, $t = 2.411$, $p = 0.016$), Pickup Service ($\beta = 0.077$, $t = 2.608$, $p = 0.009$), and Transportation ($\beta = 0.076$, $t = 2.726$, $p = 0.007$) and Customer Satisfaction. These findings indicate that improvements in packaging quality, pickup services, and transportation systems not only directly enhance customer satisfaction but also improve satisfaction indirectly through better last mile delivery performance.

Overall, the proposed research model demonstrates satisfactory explanatory and predictive capabilities. The results highlight the importance of integrating logistics operational activities to improve delivery performance and customer satisfaction in postal logistics services. This study also contributes to logistics management literature by providing empirical evidence of the mediating role of Last Mile Delivery Performance within an integrated logistics service model.

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