



Logistics HR Capabilities, IoT Integration, and Service Quality on Operational Performance: Mediating Delivery Timeliness

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Abstract

Background: The development of digital logistics demands companies to improve the speed, accuracy, transparency, and quality of operations. This study seeks to examine how logistics human resource capabilities, Internet of Things (IoT) integration, and service quality influence the company's operational performance, both directly and via delivery timeliness acting as a mediating variable within the digital logistics services of PT Pos Indonesia (Persero).

Method: This research applies a quantitative approach using the Partial Least Squares–Structural Equation Modeling (SEM-PLS) method operated through SmartPLS. Data were collected from 145 internal respondents who were familiar with digital logistics services, Service Level Agreements, tracking systems, service quality, logistics HR capabilities, and operational performance. The analysis includes testing measurement models, structural models, hypotheses, and mediating effects. This research emphasizes the importance of employee capabilities, technology integration, and service quality in improving delivery timeliness and operational performance.

Results: The findings reinforce scholarship on digital operations and logistics management and offer recommendations for firms to enhance performance by developing logistics human resource capabilities, leveraging IoT, raising service quality, and managing delivery times.

Conclusion: This study concludes that Logistics HR Capabilities, Internet of Things (IoT) Integration, and Service Quality exert a positive and significant effect on Delivery Timeliness and on Company Operational Performance. Delivery Timeliness is likewise shown to have a positive and significant effect on the Company's Operational Performance and to function as a partial mediator linking Logistics HR Capabilities, IoT Integration, and Service Quality to Operational Performance.

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INTRODUCTION

Within the digital economy era, the expansion of e-commerce has driven greater demand for logistics services that are fast, transparent, punctual, and dependable. Internet of Things (IoT) integration through real-time tracking can improve shipment visibility and operational control. Chen et al. (2023) emphasized the importance of service transparency and responsiveness. Meanwhile, Gupta et al. (2022), Koh and Yuen (2022), and Deu et al. (2025) explained that successful digitalization also depends on logistics human resource capabilities, including readiness, digital competence, analytical skills, coordination, adaptability, and problem-solving

abilities. Therefore, Logistics Human Resource Capabilities, IoT Integration, and Service Quality can improve Delivery Timeliness, which subsequently enhances Corporate Operational Performance.

PT Pos Indonesia (Persero) plays a strategic role in supporting national connectivity and distribution through its extensive network, which covers urban and rural areas as well as underdeveloped, frontier, and outermost regions (3T). Responding to e-commerce expansion and intensifying competition in the logistics sector, the company has transformed itself through service digitalization, application development, real-time tracking, and the integration of data and processes. The combination of physical networks, digital technologies, and competent human resources is essential for improving delivery timeliness, information quality, efficiency, competitiveness, and service sustainability. PT Pos Indonesia began transforming its tracking system around 2000 for internal purposes. Between 2010 and 2012, the company launched Pos Track & Trace, enabling customers to track shipments through its official website. Since 2015, the system has evolved through e-commerce API integration, mobile applications, and real-time notifications. Logistics Human Resource Capabilities, IoT Integration, and Service Quality are essential factors in improving Delivery Timeliness.

The Populix (2023) revealed that delivery services were used by 88% of Generation Z respondents and 76% of Millennial respondents. Furthermore, 71% of respondents prioritized cost and time efficiency (37%), diverse delivery destinations and options (28%), affordable shipping costs (27%), one-day insurance coverage (24%), real-time monitoring through applications (23%), packaging services (19%), nationwide delivery coverage (16%), 24-hour delivery services (14%), and shipping promotions (10%). These findings indicate that customers' increasing demand for application-based shipment monitoring, time efficiency, and diverse delivery options has heightened the importance of Delivery Timeliness. Therefore, companies must improve process coordination, real-time tracking, and rapid operational problem-solving to ensure compliance with established Service Level Agreements (SLA).

Logistics Human Resource Capabilities, IoT Integration, and Service Quality are important factors in improving Corporate Operational Performance, particularly through enhanced Delivery Timeliness. Jena and Ghadge (2021) stressed the value of combining human resource management with supply chain management to enhance performance, whereas Gupta et al. (2022) and Koh & Yuen (2022) underscored the digital readiness and competencies that logistics professionals must possess. Evangelista et al. (2023), Nhu-Mai et al. (2024), and Deu et al. (2025) further demonstrated that employee competencies and capabilities support technology effectiveness, service quality, and operational efficiency.

PT Pos Indonesia's 2025 Customer Contact Handling (CCH) data recorded 493,459 customer contacts. The main complaints concerned returns (20.88%), undelivered items or redelivery (20.77%), shipment information (13.00%), and delays (8.96%) (Indonesia, 2025). These conditions indicate problems in Service Quality and Delivery Timeliness that require improvements in tracking, coordination, information delivery, and problem resolution. Jena & Ghadge (2021), Koh and Yuen (2022), and Gupta et al. (2022) confirm that Logistics Human Resource Capabilities and digital competence underpin the effective application of technology and logistics operational processes.

Performance SLA data in 2025 shows a volume of 53,272,126 shipments, consisting of 52,056,886 on-time shipments and 1,215,240 OverSLA shipments. Punctuality reaches 97.71%, while OverSLA is 2.29% (Indonesia, 2025). Despite the high on-time delivery performance, delays may still reduce service reliability, operational efficiency, and customer trust. Sondakh and Wahyuningtyas (2021) demonstrated that sorting errors, inadequate coordination, and delivery constraints could lead to failure in meeting delivery time standards. Arroffi et al. (2021) also found that Delivery Timeliness contributes to the reliability of delivery services. Therefore, controlling OverSLA shipments remains essential for improving Corporate Operational Performance.

These phenomena show that high operational achievement is still accompanied by OverSLA shipments, returns, redelivery, delays, and inaccurate information. Delivery Timeliness must therefore be improved by strengthening Logistics Human Resource Capabilities, IoT Integration, and Service Quality.

The originality of this study rests on its simultaneous investigation of how Logistics Human Resource Capabilities, IoT Integration, and Service Quality influence Corporate Operational Performance through Delivery Timeliness as a mediating variable.

This research contributes by developing a Delivery Timeliness mediation model. Practically, it provides a basis for improving PT Pos Indonesia's performance through employee competency development, technology optimization, better service quality, and SLA control.

The urgency of this study stems from PT Pos Indonesia's need to maintain Operational Performance amid the growth of digital services, increasing expectations for timeliness, the need for real-time tracking, and the high number of customer complaints. Such conditions underscore the significance of Logistics Human Resource Capabilities, IoT Integration, and Service Quality for enhancing Delivery Timeliness and overcoming operational constraints.

This study sets out to analyze how Logistics Human Resource Capabilities, IoT Integration, and Service Quality affect Corporate Operational Performance, both directly and through Delivery Timeliness as a mediating variable, within the digital logistics services of PT Pos Indonesia (Persero).

METHOD

This research adopted a quantitative approach with an explanatory research design to clarify the causal relationships among Logistics Human Resource Capabilities, Internet of Things (IoT) Integration, Service Quality, Delivery Timeliness, and Corporate Operational Performance. This approach was selected because the study not only describes the condition of digital logistics services but also examines direct and indirect effects and the role of Delivery Timeliness as a mediating variable. The research model was estimated with Partial Least Squares-Structural Equation Modeling (SEM-PLS) in SmartPLS, given that it involves multiple latent constructs and intricate structural relationships. Hair et al. (2021, 2022) note that PLS-SEM is appropriate for research directed at model development, variance explanation, construct prediction, and the simultaneous testing of mediation.

The study was conducted at the Head Office of PT Pos Indonesia (Persero) together with supporting units linked to digital logistics services, observing operations management at the national scale. The Head Office was selected because it formulates and controls policies concerning the development of Logistics Human Resource Capabilities, IoT-based tracking-system integration, Service Quality, SLA and OverSLA management, and the evaluation of Corporate Operational Performance. Secondary data included SLA Performance, OverSLA, and Customer Contact Handling (CCH) data for 2025. Primary data collection, processing, and analysis were conducted from January to July 2026. The selection of the research object aligns with Roemer et al. (2021) and Panzeri et al. (2024), who show that digital transformation, logistics transformation, and digital literacy foster process innovation and performance at PT Pos Indonesia (Persero).

The study comprises five constructs: Logistics Human Resource Capabilities (X1), IoT Integration (X2), Service Quality (X3), Delivery Timeliness as the mediator (Y), and Corporate Operational Performance (Z), each measured by five indicators. Logistics Human Resource Capabilities include operational knowledge, digital competence, coordination, adaptability, and problem-solving. IoT Integration covers real-time tracking, information accuracy, data integration, system monitoring, and ease of access. Service Quality includes responsiveness, information clarity, reliability, complaint handling, and solution accuracy. Delivery Timeliness concerns SLA compliance and OverSLA control, while Operational Performance includes capacity, efficiency, process consistency, problem resolution, and productivity.

The research framework explains that Logistics Human Resource Capabilities (X1), IoT Integration (X2), and Service Quality (X3) affect Corporate Operational Performance (Z), both directly and through Delivery Timeliness (Y) as a mediating variable. Logistics Human Resource Capabilities support process management and problem resolution; IoT Integration provides real-time tracking information; and Service Quality strengthens response speed and solution accuracy. These three factors can improve SLA compliance and reduce OverSLA shipments. Improved Delivery Timeliness subsequently supports efficiency, productivity, process reliability, and

Corporate Operational Performance.

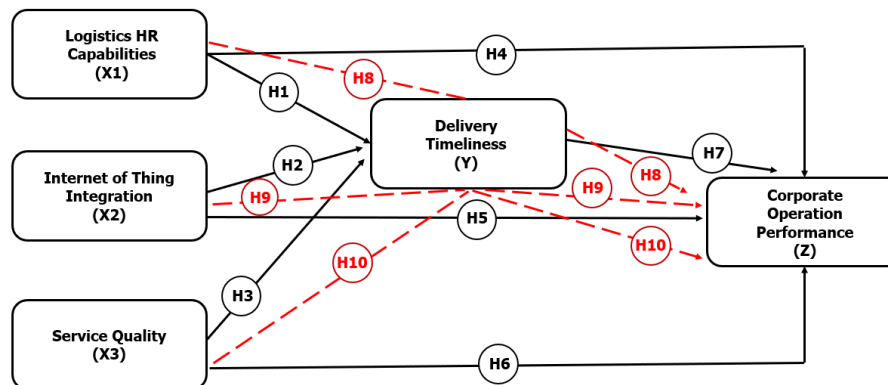


Figure 1. Research Model

Based on the theoretical framework and previous studies, the following hypotheses are proposed:

- H1 Logistics Human Resource Capabilities have a positive effect on Delivery Timeliness in digital logistics services.
- H2 Internet of Things (IoT) Integration has a positive effect on Delivery Timeliness in digital logistics services.
- H3 Service Quality has a positive effect on Delivery Timeliness in digital logistics services.
- H4 Logistics Human Resource Capabilities have a positive effect on Corporate Operational Performance in digital logistics services.
- H5 Internet of Things (IoT) Integration has a positive effect on Corporate Operational Performance in digital logistics services.
- H6 Service Quality has a positive effect on Corporate Operational Performance in digital logistics services.
- H7 Delivery Timeliness has a positive effect on Corporate Operational Performance in digital logistics services.
- H8 Delivery Timeliness mediates the effect of Logistics Human Resource Capabilities on Corporate Operational Performance in digital logistics services.
- H9 Delivery Timeliness mediates the effect of Internet of Things (IoT) Integration on Corporate Operational Performance in digital logistics services.
- H10 Delivery Timeliness mediates the effect of Service Quality on Corporate Operational Performance in digital logistics services.

The number of samples was determined using the Inverse Square Root Method developed by Kock and Hadaya (2018) and Jhantasana (2023). This method estimates the minimum sample count based on the expected lowest path coefficient. With a significance level of 5%, statistical power of 80%, constant α of 2.486, and a minimum path coefficient of 0.22, the calculation of $N = (2.486/0.22)^2 = 127.69$ was obtained, so that the minimum sample requirement was rounded to 128 respondents. To anticipate around 5% of the data that were incomplete or did not meet the criteria, the number was adjusted to $128/(1-0.05)=134.74$ and rounded to 135 respondents. This study succeeded in obtaining 145 respondents who met the criteria, so that the number of samples exceeded the minimum requirement and was considered adequate for PLS-SEM analysis.

The research instrument took the form of a closed questionnaire comprising 25 statements, with each variable captured by five indicators. Respondents' responses were captured on a five-point Likert scale, where 1 denotes strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. The questionnaire was administered online via Google Form to internal employees, who were first informed of the study's purpose, the procedures for completing it, and

the confidentiality of their data. Beyond primary data, the study draws on secondary data gathered from literature reviews, scientific journals, operational reports, internal documents, and the 2025 SLA Performance, OverSLA, and CCH records.

Data were analyzed with SEM-PLS in SmartPLS across two principal stages, namely assessment of the measurement model (outer model) and of the structural model (inner model). The outer model was examined using outer loadings and AVE for convergent validity; cross loadings, the Fornell and Larcker (1981) and Kim and Song (2026) criterion, and HTMT for discriminant validity; and Cronbach's Alpha, Composite Reliability, and rho_A for construct reliability. The internal evaluation of the model includes VIF to detect multicollinearity, R² to see the model's explanatory ability, f² to assess effect size, and path coefficient to determine the direction and strength of the relationship. Hypothesis testing was performed via bootstrapping, applying the criteria of a t-statistic above 1.96 and a p-value below 0.05, while mediation was evaluated through specific indirect effects to establish whether no mediation, partial mediation, or full mediation occurred. The procedure refers to Ghozali (2021) and Hair et al. (2021, 2022).

RESULTS AND DISCUSSION

Result

Study Profile and Respondent Characteristics

Table 1

Respondent Demographics

Category	Criteria	Quantity	Percentage (%)
Gender	Male	81	55,9 %
	Female	64	44,1%
Age	< 25 Years	14	9,7 %
	25 - 35 Years	71	49 %
	36 - 45 Years	31	21,4 %
	> 45 Years	29	20 %
Highest Level of Education	High School/Junior High School	34	23,4 %
	Diploma	41	28,3 %
	Diploma 4 (D4)/Bachelor's Degree (S1)	64	44,1 %
	Postgraduate (S2)	6	4,1 %
Length of Service	1-5 Years	26	17,9%
	6-10 Years	36	24,8%
	> 10 Years	83	57,2%
Work Unit	Courier and Logistics Business	45	31,0%
	Courier and Logistics Operations	58	40,0%
	Customer Complaint Handling / Customer Service	18	12,4%
	Information Technology	24	16,6%
Work Area	Head Office	67	46,2%
	Main Branch/Branch Office	46	31,7%
	Postal Processing Center (SPP)	22	15,2%
	Regional	10	6,9%
Position	Staff	55	37,9%
	Functional	54	37,2%
	Assistant Manager	13	9,0%
	Manager/Senior Manager	23	15,9%

Source: Researcher Processing

As shown in Table 1, the 145 respondents were predominantly male, comprising 81 individuals (55.9%). The majority of respondents aged 25–35 years were 71 people (49.0%), 64 people (44.1%) had D4/S1 education, and 83 people (57.2%) had a working period of more than

10 years. Based on work units, the most respondents came from Courier and Logistics Operations as many as 58 people (40.0%), with the majority of work areas in the Head Office as many as 67 people (46.2%). As for position, respondents were dominated by staff as many as 55 people (37.9%) and functional as many as 54 people (37.2%). The composition shows that respondents have diverse and relevant backgrounds to assess digital logistics services as well as the company's operational performance.

Variable Specification Overview: Evaluation of the Measurement Model (Outer Model)

Assessment of the outer model serves to verify the validity and reliability of the indicators prior to testing the inner model. The tests included convergent validity, discriminant validity, Cronbach's Alpha, Composite Reliability, and AVE. An indicator was deemed valid when its outer loading exceeded 0.70, and a construct was deemed reliable when its Cronbach's Alpha and Composite Reliability exceeded 0.70 and its AVE exceeded 0.50 (Ghozali, 2021; Hair et al., 2021, 2022; Hair & Alamer, 2022).

Table 2
Outer Loading Results

	KSD_X1	IOT_X2	KL_X3	KWP_Y	KOP_Z	Standard	Status
X1_1	0,881					> 0.700	Valid
X1_2	0,885					> 0.700	Valid
X1_3	0,816					> 0.700	Valid
X1_4	0,872					> 0.700	Valid
X1_5	0,830					> 0.700	Valid
X2_1		0,833				> 0.700	Valid
X2_2		0,874				> 0.700	Valid
X2_3		0,842				> 0.700	Valid
X2_4		0,870				> 0.700	Valid
X2_5		0,807				> 0.700	Valid
X3_1			0,812			> 0.700	Valid
X3_2			0,850			> 0.700	Valid
X3_3			0,846			> 0.700	Valid
X3_4			0,814			> 0.700	Valid
X3_5			0,838			> 0.700	Valid
Y_1				0,863		> 0.700	Valid
Y_2				0,844		> 0.700	Valid
Y_3				0,861		> 0.700	Valid
Y_4				0,866		> 0.700	Valid
Y_5				0,815		> 0.700	Valid
Z_1					0,850	> 0.700	Valid
Z_2					0,819	> 0.700	Valid
Z_3					0,808	> 0.700	Valid
Z_4					0,840	> 0.700	Valid
Z_5					0,805	> 0.700	Valid

Source: Researcher Processing

Table 2 shows that all 25 indicators have an outer loading value above 0.70, with the highest value on X2 at 0.885 and the lowest at X3 at 0.816. These results show that all indicators are able to reflect their constructs well and have met the reliability and convergent validity indicators. This is consistent with Iqbal et al. (2022), Zhaolei et al. (2023), Liu et al. (2023), and

Tan et al. (2024), who applied an outer loading threshold above 0.70 or 0.708 as the benchmark for indicator reliability and convergent validity.

Indicator Correlation Analysis (Discriminant Validity)

Discriminant validity is assessed to confirm that one construct is genuinely distinct from another. The test for discriminant validity was conducted by examining the Fornell-Larcker Criterion and the Heterotrait-Monotrait Ratio (HTMT) values. A construct is regarded as satisfying discriminant validity when the square root of its AVE surpasses its correlations with the other variables. Moreover, an HTMT value below 0.90 signals that the construct possesses sound discriminant validity.

Table 3

Fornell-Lacker Test Results

Variable	X2	Y	X1	Z	X3
IoT Integration (X2)	0,845				
Delivery Timeliness (Y)	0,490	0,850			
Logistics Human Resource Capabilities (X1)	0,139	0,582	0,857		
Company Operational Performance (Z)	0,489	0,782	0,582	0,825	
Service Quality (X3)	0,142	0,598	0,365	0,602	0,832

Source: Researcher Processing

Table 3 shows that the square root of AVE of each construct, i.e. X2 is 0.845, Y is 0.850, X1 is 0.857, Z is 0.825, and X3 is 0.832, is higher than the correlation between constructs. Accordingly, all variables satisfy the Fornell-Larcker criteria and are judged to exhibit good discriminant validity (Hair et al. 2021, 2022).

Table 4

Heterotrait-Monotrait Ratio (HTMT)

Variable	X2	Y	X1	Z
IoT Integration (X2)				
Delivery Timeliness (Y)	0,542			
Logistics Human Resource Capabilities (X1)	0,148	0,639		
Company Operational Performance (Z)	0,547	0,873	0,648	
Service Quality (X3)	0,168	0,662	0,404	0,678

Source: Researcher Processing

Based on Table 4, all HTMT values are below 0.90, with the highest value of 0.873 in relation to Logistics HR Capability and Company Operational Performance. Thus, all constructs meet discriminant validity and have adequate differences (Panzeri et al., 2024; Roemer et al., 2021).

Variable Reliability and Average Variance Extract

The reliability of the variables is examined using Cronbach's Alpha, rho_A, and Composite Reliability (CR), each required to exceed a threshold of 0.70. In addition, convergent validity at the construct level is verified through the Average Variance Extracted (AVE), which must exceed 0.50 (Hair et al., 2022).

Table 5
Reliability Test Results and Average Variance Extracted (AVE)

Variables	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Logistics Human Resource Capabilities (X1)	0,910	0,914	0,933	0,735
IoT Integration (X2)	0,900	0,902	0,926	0,715
Service Quality (X3)	0,889	0,890	0,918	0,692
Delivery Timeliness (Y)	0,904	0,906	0,929	0,723
Company Operational Performance (Z)	0,882	0,883	0,914	0,680

Source: Researcher Processing

Table 5 shows that the entire construct has Cronbach's Alpha, rho_A, and Composite Reliability values above 0.70 and AVE above 0.50. Hence, all variables are confirmed reliable, satisfy convergent validity, and are appropriate for structural model testing (Simons et al., 2021; [Hair & Alamer, 2022](#)).

Inner Model Evaluation

Prior to evaluating the structural model (inner model), a collinearity check was performed among the predictor variables using the Inner VIF value, ensuring that no multicollinearity would bias the path coefficient results. The required VIF value is below 5 ([Hair et al., 2022](#)).

Inner VIF Value Analysis

The inner model was evaluated using the R-Square value to gauge how well the independent variables explain the dependent variables, together with the VIF to identify multicollinearity. Structural models are considered good if they have sufficient clear power and do not show collinearity problems ([Hair & Alamer, 2022](#)).

Table 6
Inner VIF Values Results

Relationships Between Variables	VIF
Logistics Human Resource Capabilities (X1) -> Delivery Timeliness (Y)	1,164
IoT Integration (X2) -> Delivery Timeliness (Y)	1,030
Service Quality (X3) -> Delivery Timeliness (Y)	1,166
Logistics Human Resource Capabilities (X1) -> Company Operational Performance (Z)	1,579
IoT Integration (X2) -> Company Operational Performance (Z)	1,441
Service Quality (X3) -> Company Operational Performance (Z)	1,632
Delivery Timeliness (Y) -> Company Operational Performance (Z)	2,852

Source: Researcher Processing

Table 6 shows that the overall Inner VIF score is below 5, with the highest score of 2.852 in the relationship of Logistics HR Capability to Company Operating Performance. These results point to the absence of multicollinearity in the structural model, so the estimated path coefficients can be considered stable and R-Square testing may proceed ([Hair & Alamer, 2022](#)).

Table 7
R Squares

Endogenous Variables	R Square	R Square Adjusted	Category
Delivery Timeliness (Y)	0,649	0,642	Moderate
Company Operational Performance (Z)	0,701	0,693	Strong

Source: Researcher Processing

Table 7 shows that Logistics Human Resource Capabilities, IoT Integration, and Service Quality explained 64.9% of the variance in Delivery Timeliness. Logistics Human Resource Capabilities, IoT Integration, Service Quality, and Delivery Timeliness explained 70.1% of the variance in Corporate Operational Performance. Following Hair et al. (2022), these R^2 values lie within the moderate-to-strong and strong ranges, indicating that the model explains Delivery Timeliness and Corporate Operational Performance well.

Significant Testing of Path Coefficients

Path coefficient testing was undertaken to establish the size and direction of the direct effects among variables within the structural model. Table 4.14 presents the value of the original sample (O) of the path coefficient along with the value of f Square (f^2) as a measure of the effect size.

Table 8
Path Coefficient and f Square (f^2) Results

Hypothesis	Relationships Between Variables	Original Sample (O)	f^2
H1	Logistics Human Resource Capabilities (X1) -> Delivery Timeliness (Y)	0,381	0,356
H2	IoT Integration (X2) -> Delivery Timeliness (Y)	0,380	0,399
H3	Service Quality (X3) -> Delivery Timeliness (Y)	0,404	0,400
H4	Logistics Human Resource Capabilities (X1) -> Company Operational Performance (Z)	0,237	0,119
H5	IoT Integration (X2) -> Company Operational Performance (Z)	0,235	0,129
H6	Service Quality (X3) -> Company Operational Performance (Z)	0,257	0,136
H7	Delivery Timeliness (Y) -> Company Operational Performance (Z)	0,375	0,165

Source: Researcher Processing

Table 8 shows that all relationships among variables were positive. Service Quality had the strongest effect on Delivery Timeliness, with a coefficient of 0.404 and an f^2 value of 0.400. Logistics Human Resource Capabilities had a coefficient of 0.381 and an f^2 value of 0.356, while IoT Integration had a coefficient of 0.380 and an f^2 value of 0.399. All three effects were large. The direct effects of Logistics Human Resource Capabilities, IoT Integration, and Service Quality on Corporate Operational Performance had f^2 values of 0.119, 0.129, and 0.136, respectively, indicating small effects. Delivery Timeliness had a medium effect on Corporate Operational Performance, with a coefficient of 0.375 and an f^2 value of 0.165. Thus, Logistics Human Resource Capabilities, IoT Integration, and Service Quality strongly contributed to Delivery Timeliness, while Delivery Timeliness played an important role in improving Corporate Operational Performance (Hair & Alamer, 2022).

Path-coefficient testing served to determine the direction and significance of the relationships among variables. A relationship was deemed significant when its t-statistic was

greater than 1.96 and its p-value was less than 0.05.

Table 9
Hypothesis Test Results

Hypothesis	Variable Relationships	Original Sample	t-Statistic	p-Value	Description
H1	$X1 \rightarrow Y$	0,381	6,552	0,000	Accepted
H2	$X2 \rightarrow Y$	0,380	6,561	0,000	Accepted
H3	$X3 \rightarrow Y$	0,404	7,918	0,000	Accepted
H4	$X1 \rightarrow Z$	0,237	3,905	0,001	Accepted
H5	$X2 \rightarrow Z$	0,235	4,338	0,001	Accepted
H6	$X3 \rightarrow Z$	0,257	4,035	0,001	Accepted
H7	$Y \rightarrow Z$	0,375	4,695	0,001	Accepted

Source: Researcher Processing

Table 9 indicates that every direct relationship among the variables is significant, as reflected by t-statistics above 1.96 and p-values below 0.05. Thus, all influence hypotheses are directly accepted, so that Logistics HR Capabilities, IoT Integration, Service Quality, and Delivery Timeliness are shown to exert a significant influence within the research structural model (Hair & Alamer, 2022). The results of Bootstrapping can be presented in the figure 2.

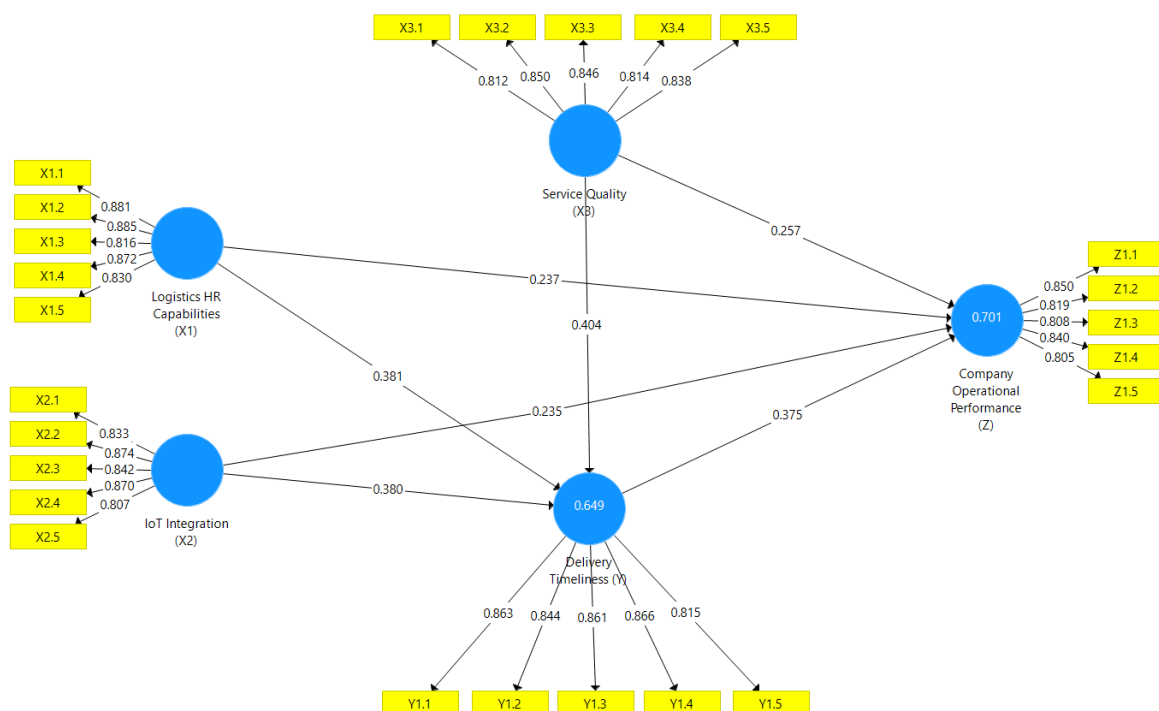


Figure 2. PLS Algorithm Analysis Results

Intermediate Effect Analysis (Mediation)

The mediation analysis was conducted to determine whether Delivery Timeliness (Y) could mediate the influence of Logistics Human Resource Capabilities (X1), IoT Integration (X2), and Service Quality (X3) on the Company's Operational Performance (Z). Mediation was tested using specific indirect effects. A mediation effect was regarded as significant when the t-statistic was above 1.96 and the p-value below 0.05.

Table 10
Mediation Effect Analysis Results

Hypothesis	Mediation Relationship	Indirect Effect	t-Statistic	p-Value	Description
H8	$X1 \rightarrow Y \rightarrow Z$	0,141	3,773	0,001	Accepted
H9	$X2 \rightarrow Y \rightarrow Z$	0,140	4,045	0,001	Accepted
H10	$X3 \rightarrow Y \rightarrow Z$	0,150	3,812	0,001	Accepted

Source: Researcher Processing

As presented in Table 10, all mediated relationships yielded t-statistics greater than 1.96 and p-values less than 0.05.

Discussion

The results show that Logistics Human Resource Capabilities, IoT Integration, and Service Quality had positive and significant effects on Delivery Timeliness. Service Quality had the strongest effect, with a coefficient of 0.404, followed by Logistics Human Resource Capabilities at 0.381 and IoT Integration at 0.380. These findings suggest that swift responses, accurate information, operational and digital competence, coordination, and the deployment of real-time tracking systems enable the company to meet SLAs, curb OverSLA shipments, and address delivery constraints. The results corroborate Katinienė et al. (2021), who highlight the role of logistics workforce competencies in sustaining the efficiency and continuity of organizational processes, and Koh and Yuen (2022), who contend that logistics digitalization demands logistics, business, digital, and personal competencies.

Logistics Human Resource Capabilities, IoT Integration, Service Quality, and Delivery Timeliness also had direct effects on Corporate Operational Performance. Delivery Timeliness had the largest direct effect, with a coefficient of 0.375, followed by Service Quality at 0.257, Logistics Human Resource Capabilities at 0.237, and IoT Integration at 0.235. These results indicate that SLA compliance and OverSLA control are important for improving operational effectiveness, efficiency, productivity, and reliability. Logistics Human Resource Capabilities, the use of real-time tracking information, and fast, clear service also improve Corporate Operational Performance. These findings align with Syafrianita et al. (2025), Nong et al. (2024), and Dwita and Sadana (2021), who stress the contributions of technology, service quality, and organizational capabilities to improved logistics performance.

Indirect influence testing shows that Delivery Timeliness mediated the effects of Logistics Human Resource Capabilities, IoT Integration, and Service Quality on Corporate Operational Performance. The largest mediation effect was found in the relationship between Service Quality and Corporate Operational Performance (0.150), followed by Logistics Human Resource Capabilities (0.141) and IoT Integration (0.140). Since both the direct and indirect effects were significant, Delivery Timeliness functioned as a partial mediator. In other words, Logistics Human Resource Capabilities, IoT Integration, and Service Quality can directly improve Operational Performance, while part of their effects is also transmitted through improved SLA compliance and delay control. This result reinforces Deu et al. (2025), who maintain that combining skilled employees, technology, and coordination is crucial for enhancing the operational efficiency of logistics firms.

Overall, the support for all hypotheses (H1-H10) confirms that PT Pos Indonesia's Operational Performance is influenced by Logistics Human Resource Capabilities, IoT Integration, Service Quality, and Delivery Timeliness. The model explained 64.9% of the variance in Delivery Timeliness and 70.1% of the variance in Corporate Operational Performance, demonstrating strong explanatory power. Theoretically, this study broadens the digital logistics literature by framing Delivery Timeliness as the mechanism through which human resource, technological, and service factors shape Operational Performance. Practically, PT Pos Indonesia should prioritize employee competency development, tracking-system optimization, service-quality improvement, cross-unit coordination, and SLA and OverSLA control to improve Operational Performance optimally and sustainably.

CONCLUSION

The results show that Logistics Human Resource Capabilities, IoT Integration, and Service Quality had positive and significant effects on Delivery Timeliness and Corporate Operational Performance. Delivery Timeliness also had a positive and significant effect on Corporate Operational Performance and partially mediated the effects of Logistics Human Resource Capabilities, IoT Integration, and Service Quality on Corporate Operational Performance. Accordingly, all hypotheses (H1-H10) were supported. Simultaneously, Logistics Human Resource Capabilities, IoT Integration, and Service Quality explained 64.9% of the variance in Delivery Timeliness. Logistics Human Resource Capabilities, IoT Integration, Service Quality, and Delivery Timeliness explained 70.1% of the variance in Corporate Operational Performance. These results show that the research model possesses strong explanatory power in describing how Operational Performance is optimized within PT Pos Indonesia's digital logistics services.

Theoretically, this study strengthens the literature on operations management, logistics management, logistics technology, and human resource management by positioning Delivery Timeliness as a mechanism that transmits the effects of Logistics Human Resource Capabilities, IoT Integration, and Service Quality on Corporate Operational Performance. The findings reveal that human resource, technological, and service factors can enhance performance both directly and indirectly via SLA compliance and OverSLA shipment control. Practically, the findings suggest that PT Pos Indonesia (Persero) should improve Corporate Operational Performance through an integrated approach involving the development of employees' operational knowledge and digital competence, optimization of IoT-based real-time tracking systems, improved service speed and clarity, stronger cross-unit coordination, and tighter SLA and OverSLA control. These efforts are required to address delivery constraints promptly, improve Delivery Timeliness, and sustain Corporate Operational Performance.

A limitation of this study is its reliance on internal employees' perceptions obtained through self-assessment, which may render the measurements susceptible to respondent subjectivity. In addition, the research object was limited to the digital logistics services of PT Pos Indonesia (Persero), used supporting operational data only for 2025, examined only five variables, and adopted a quantitative approach. Therefore, the findings cannot yet be generalized broadly or describe long-term performance developments.

Further research is suggested to expand the research objects and observation periods, use more diverse assessment sources, and include variables such as digital culture, leadership, technological readiness, training effectiveness, organizational support, distribution infrastructure, and transportation capacity. A mixed-method approach could also provide a deeper analysis of how Logistics Human Resource Capabilities, IoT Integration, and Service Quality improve Delivery Timeliness and how Delivery Timeliness subsequently enhances Corporate Operational Performance.

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AUTHOR CONTRIBUTION STATEMENT

Neneng Kristanti, Agus Purnomo, and Melia Eka Lestiani jointly contributed to the conceptualization and development of the research framework, the methodology, the interpretation of findings, and the preparation of the manuscript. Neneng Kristanti contributed to data collection, data processing, formal analysis, and preparation of the initial manuscript. Agus Purnomo and Melia Eka Lestiani contributed to methodological refinement, interpretation of the research findings, and improvement of the manuscript. All authors took part in finalizing the manuscript, approved its final version, and agreed to be accountable for the integrity of the work.

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