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Analysis of Passenger Handling, Baggage Volume, and Aircraft Rotation on Operational Cost Efficiency Mediated by on-time Performance at CITILINK Airlines

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Abstract: *This study aims to analyze the effect of passenger handling, baggage volume and aircraft rotation on operational cost effectiveness mediated by on-time performance at Citilink airlines. The problem in this study is that the influence between the independent variables (passenger handling, baggage volume, aircraft rotation) and the dependent variable (operational cost effectiveness) mediated by on-time performance is quite complex. The research design used is quantitative with data analysis using SEM PLS with 100 respondents consisting of operational officers, passenger handling, baggage handling and administration. where the significant level is 0.05 to state whether the null hypothesis or alternative hypothesis is accepted or rejected. The results showed that there is a significant influence between Passenger Handling and operational cost effectiveness with a P value of 0.023. There is a significant positive relationship between baggage volume and operational cost effectiveness with a P value of 0.005. The effect of aircraft rotation and operational cost effectiveness with a P value of 0.003 which means there is a significant influence. On-time performance has a very significant influence on operational cost effectiveness with a P value of 0.000. Passenger handling has a significant effect on on-time performance with a P value of 0.000. There is no significant influence between baggage volume and operational cost effectiveness through on-time performance with a P value of 0.156. The effect of aircraft rotation shows a significant effect on operational cost effectiveness through on-time performance with a P value of 0.000.*

Keyword: Passenger Handling, Baggage Volume, Aircraft Rotation, Effectiveness of Operational Costs, On-time Performance.

INTRODUCTION

The aviation sector plays a strategic role in driving economic growth and enhancing society's ability to interact with one another. Citilink, one of Indonesia's low-cost carriers, focuses on operational efficiency to remain competitive in an increasingly challenging market. In such circumstances, operational efficiency encompasses not only technical aspects but also passenger handling, baggage management, and aircraft rotation.

Challenges related to on-time performance (OTP) have intensified in recent years. Flight delays frequently occur due to factors such as ineffective baggage management, tight aircraft rotation schedules, and slow passenger handling times. Consequently, operational costs increase. Airlines face significant challenges, as the inability to maintain OTP can adversely affect the company's reputation, customer loyalty, and financial performance. These challenges are further compounded by the unique operational model of Low-Cost Carriers (LCCs), which prioritize cost efficiency through specific strategies that directly impact operational performance.

The Low-Cost Carrier (LCC) model represents a unique aviation strategy that focuses on reducing operating costs and achieving cost efficiency across all aspects of operations. Several key characteristics of LCCs include cabin and aircraft fleet standardization, the elimination of business class services, and the reduction or removal of in-flight services — wherein services are still provided but incur additional charges beyond the ticket price. Furthermore, the ticketing process is simplified through the utilization of Information Technology (IT) by implementing electronic tickets. LCCs primarily operate short-haul, point-to-point flights, minimize or eliminate mileage programs (membership), and utilize secondary airports to reduce airport service fees during peak hours. Additionally, LCCs maximize aircraft utilization to minimize fleet maintenance costs (Yowanda & Mawardi, 2017).

Table 1. Citilink Airline Operational Costs
Operating Expenses for 2021-2022 (in USD)

Description	2022	2021	Growth	
			Nominal	Percentage (%)
Flight Operations	495.338.007	384.406.202	110.931.805	28.9
Maintenance and Repairs	198.897.679	244.739.785	(45.842.106)	(18.7)
Ticketing, Sales, and Promotion	20.168.883	23.397.902	(3.229.019)	(13.8)
Airport	43.547.677	46.869.426	(3.321.750)	7.1
Passenger Services	14.697.198	16.750.319	(2.053.120)	(12.3)
Administration and General	19.760.328	18.925.219	835.109	4.4
Total	792.409.772	735.088.852	57.320.920	7.8

Source: (Citilink, 2022)

PT. Citilink Indonesia focuses on departure punctuality, known as On-Time Performance (OTP), although the results have not met expectations. This is evidenced by the fluctuating OTP outcomes in 2018. Nevertheless, PT. Citilink Indonesia remained determined to make OTP a crucial part of its business processes in 2019. In that year, the airline increased its OTP target to 90%, up from 85% in 2017 and 2018. Furthermore, PT. Citilink Indonesia demonstrated a stronger commitment to achieving this 90% OTP target in 2019 (Muttaqijn & Aji, 2020).

Table 2. Citilink Indonesia On-Time Performance (OTP) for 2017–2023

Month	2017		2018		2019		2020		2021		2022		2023	
	OTP	DELAY	OTP	DELAY	OTP	DELAY	OTP	DELAY	OTP	DELAY	OTP	DELAY	OTP	DELAY
JAN	81%	19%	81,73%	18,27%	90%	10%	87%	13%	88%	12%	77%	23%	68%	32%
FEB	83%	17%	83,02%	16,98%	93%	7%	91%	9%	88%	12%	84%	16%	65%	35%
MAR	83%	17%	88,15%	11,85%	93%	7%	91%	9%	81%	19%	76%	24%	80%	20%
APR	80%	20%	77,70%	22,30%	95%	5%	98%	2%	80%	20%	74%	26%	91%	9%
MEI	85%	15%	83,84%	16,16%	97%	3%	94%	6%	72%	23%	68%	32%	91%	9%

JUN	89%	11%	87,10%	16,03%	94%	6%	95%	5%	81%	19%	65%	35%	90%	10%
JUL	82%	18%	84,61%	19,90%	93%	7%	96%	4%	87%	13%	58%	42%	92%	8%
AUG	82%	18%	83,00%	17,00%	92%	8%	96%	4%	88%	12%	76%	24%	91%	9%
SEP	81%	19%	82,54%	17,46%	89%	11%	95%	5%	80%	20%	75%	25%	88%	12%
OCT	82%	18%	87,67%	12,33%	89%	11%	94%	6%	75%	25%	73%	27%	93%	7%
NOV	81%	19%	79,62%	20,38%	90%	10%	81%	19%	69%	31%	70%	30%	93%	7%
DEC	79%	21%	86,17%	13,83%	88%	12%	82%	18%	61%	39%	62%	38%	92%	8%
Average	**82%**	**18%**	**84%**	**17%**	**92%**	**8%**	**92%**	**8%**	**79%**	**20%**	**72%**	**29%**	**86%**	**14%**

Source: Citilink (2022)

Table 2 shows that the average On-Time Performance (OTP) of Citilink Indonesia improved from 2017 to 2020 but declined in 2021 and 2022. The airline's delay percentage decreased from 18% in 2017 to 8% in 2020 but rose to 20% in 2021 and further increased to 29% in 2022. These delays were caused by various factors such as passenger/baggage handling, cargo/mail handling, aircraft and ramp handling, technical issues, aircraft and automated equipment failure (system), operations and crew, weather, airport and government authorities, reactionary factors, and other miscellaneous reasons. However, in 2023, the OTP percentage improved to 86%, while the delay percentage decreased to 14%.

Research has extensively examined the operational efficiency of airlines, particularly concerning elements such as passenger handling, baggage volume, and aircraft rotation. However, several issues remain underexplored in the literature:

Lack of a Holistic Approach to Operational Variables Most studies focus on a single operational factor, such as passenger handling or baggage volume, without considering the interplay between multiple variables.

The Role of On-Time Performance as a Mediating Variable On-Time Performance (OTP) is often regarded as a key performance indicator for airlines. However, its role as a mediating variable between operational factors and operational cost efficiency has received limited attention. This study aims to investigate how OTP may strengthen or weaken the influence of operational components on cost efficiency.

This study aims to analyze the direct impact of passenger handling, baggage volume, aircraft rotation, and on-time performance (OTP) on operational cost efficiency at Citilink Indonesia. Additionally, it seeks to examine the mediating role of OTP in the relationship between passenger handling, baggage volume, and aircraft rotation with operational cost efficiency.

The Relationship Between Passenger Handling and Operational Cost Efficiency.

Passenger handling encompasses all activities related to passenger services at the airport, from check-in, security screening, and boarding to baggage handling, each of which directly and indirectly impacts operational costs. Efficient passenger handling processes can minimize delays and optimize resource utilization, contributing to improved cost efficiency. According to Hurriyaturrohman (2016), cost management systems aim to achieve four key objectives: identifying activity costs, determining the efficiency, effectiveness, and economy of activities, enhancing future performance, and achieving these goals simultaneously amidst technological advancements. In the context of passenger handling, understanding these cost drivers is crucial for optimizing processes and reducing operational expenses, ultimately enhancing overall efficiency.

H1: There *is an influence of Passenger Handling on the operational cost efficiency of Citilink Indonesia.*

The Relationship Between Baggage Volume and Operational Cost Efficiency

Baggage volume directly impacts operational cost efficiency, as higher volumes require more labor, time, and equipment for processing, loading, and unloading, increasing costs related to wages, equipment use, and maintenance. Effective cost management is crucial for controlling these expenses (Blocher et al., 2007). Additionally, baggage management in international flights follows two main concepts: weight-based and piece-based (Keke & Primadi Candra Susanto, 2019). Proper strategies can help optimize processes and reduce operational costs while maintaining service quality.
H2: There is an influence of Baggage Volume on the Operational Cost Efficiency of Citilink Indonesia.

The Relationship Between Aircraft Rotation and Operational Cost Efficiency

Faster turnaround times enable aircraft to perform more flights per day, increasing aircraft utilization. This higher utilization allows fixed costs such as aircraft leasing, maintenance, and insurance to be spread across more flights, reducing the cost per flight. Additionally, a case study on two long-haul aircraft demonstrated that overall fuel efficiency can be improved through aircraft rotation. The maximum difference in cruise flight efficiency between the two aircraft was less than 0.1%, mitigating the side effects of deviations from design conditions (Liu & Zhou, 2018). Optimizing aircraft rotation not only enhances operational efficiency but also contributes to reducing overall operational costs.
H3: There is an influence of Aircraft Rotation on the Operational Cost Efficiency of Citilink Indonesia.

The Relationship Between On-Time Performance and Operational Cost Efficiency

On-Time Performance (OTP) reflects an airline's ability to operate flights according to schedule, directly impacting various aspects of operational costs. High OTP indicates strong airline performance, while low OTP suggests frequent flight delays, which can increase costs related to fuel, crew overtime, and passenger compensation (Zulaichah, 2014). Effective cost management plays a crucial role in controlling these expenses, as it focuses on managing the company's operational costs (Blocher et al., 2007). To maintain high OTP, airlines must minimize flight delays, which can enhance efficiency and reduce overall operational costs (Setiawan et al., 2021).
H4: There is an influence of On-Time Performance on the Operational Cost Efficiency of Citilink Indonesia.

The Relationship Between Passenger Handling and Operational Cost Efficiency Mediated by On-Time Performance

Efficient passenger handling plays a crucial role in achieving good On-Time Performance (OTP), as smooth processes from check-in to boarding minimize delays and enhance punctuality. Good OTP directly reduces inefficiencies and additional operational costs. However, operational challenges such as waiting for the Pilot in Command (PIC), delays in cabin crew readiness, or incomplete cabin preparation while passengers are ready to board can disrupt OTP and increase costs (Mahardhito Gifari, 2017). Thus, effective passenger handling not only improves OTP but also contributes to greater operational cost efficiency.
H5: There is an influence of Passenger Handling on the Operational Cost Efficiency through On-Time Performance of Citilink Indonesia.

The Relationship Between Baggage Volume and Operational Cost Efficiency Mediated by On-Time Performance

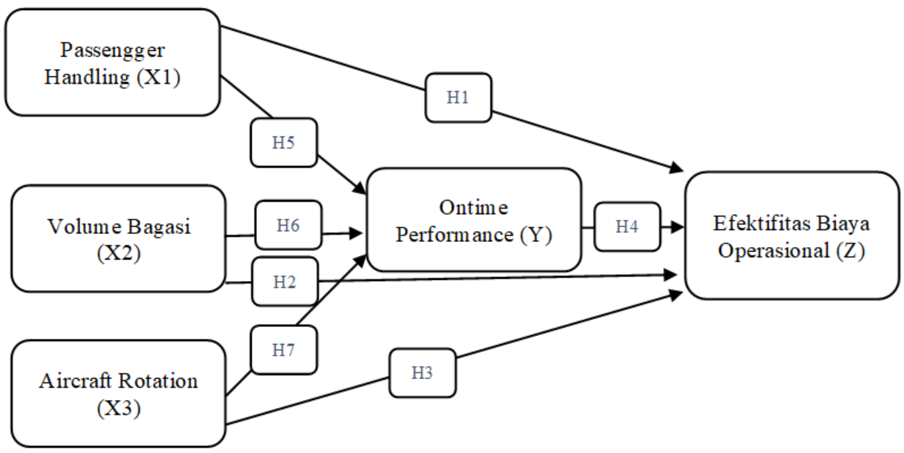
The volume of baggage significantly impacts the duration of baggage handling processes, including loading and unloading. A higher baggage volume extends these processes, increasing total aircraft weight, which in turn raises fuel consumption and operational costs. To mitigate delays and improve On-Time Performance (OTP), Citilink Indonesia has implemented quick handling measures to address potential flight delays efficiently (Sofyan & Maulana, 2022). Similarly, enforcing stricter regulations and ensuring crew compliance with established protocols have been identified as crucial steps in enhancing OTP, as evidenced by Sriwijaya Air's efforts to address its punctuality challenges (Arifianto & Dwiyanto, 2013). Consequently, effective baggage management not only optimizes OTP but also indirectly contributes to improving operational cost efficiency.

H6: There is an influence of Baggage Volume on Operational Cost Efficiency through On-Time Performance at Citilink Indonesia.

The Relationship Between Aircraft Rotation and Operational Cost Efficiency Mediated by On-Time Performance

Aircraft rotation efficiency plays a crucial role in enhancing aircraft utilization and reducing operational costs. Shorter rotation times allow aircraft to be used for more flights, thereby increasing operational efficiency. However, slow baggage handling can extend turnaround time, disrupt subsequent flight schedules, and lower On-Time Performance (OTP). Additionally, the activities of the Ramp Handling unit not only impact flight safety (Prasetyo & Pradana, 2022) but also affect the speed of ground processes, contributing to smoother aircraft rotation. Therefore, optimizing ramp handling processes is key to maintaining OTP, which ultimately supports operational cost efficiency through improved aircraft rotation.

H7: There is an influence of Aircraft Rotation on the Operational Cost Efficiency through On-Time Performance at Citilink Indonesia.



Source: Research Results

Figure 1. Conceptual Framework

METHOD

This study was conducted on Citilink Indonesia, with the research period spanning from February to September 2024. The research population consisted of 100 operational staff at Syamsudin Noor Airport Banjarmasin, responsible for passenger handling, baggage handling, aircraft rotation, as well as recording departure and arrival schedules. This study employed a saturated sampling method, involving the entire population as the sample, totaling 100 individuals. The data collected is quantitative, with the primary method being the distribution of questionnaires to the operational staff. To test the hypothesis, this study applied the Structural

Equation Model (SEM) approach based on Partial Least Square (PLS) 3, which is used to analyze complex relationships between variables that are difficult to measure directly (Juliandi, 2018).

In PLS-SEM, model evaluation is conducted in two stages: the measurement model (outer model) and the structural model (inner model). The measurement model is used to assess construct validity through convergent and discriminant validity tests. Meanwhile, the structural model evaluates the relationships between variables using two main criteria: the R-Square value and significance. The R-Square value measures the degree of variation in the dependent variable caused by the independent variables, categorized as strong (0.75), moderate (0.50), and weak (0.25). Significance is tested using t-values, where a value of 1.65 indicates a significance level of 10%, 1.96 for 5%, and 2.58 for 1%. This approach allows researchers to identify and comprehend the influences emerging between research variables more comprehensively (Ghozali & Latan, 2015:85) in (Juliandi, 2018).

Table 3. Indicators

Variable	Indicator
***Passenger Handling* (IATA, 2024)**	1. Passenger handling staff competence in the reservation system 2. Integrated reservation system 3. Security detection tools 4. Passenger information system
***Baggage Volume* (Keke & Primadi Candra Susanto, 2019)**	1. The allowed baggage policy is quite ideal 2. Regulation for excess baggage 3. Regulation for booking baggage before check-in 4. Regulation for cabin and cargo baggage
***Aircraft Rotation* (Soebandrija & Nurlatifah, 2014)**	1. Well-planned and organized flight schedule 2. Communication between teams during the rotation process 3. Adequacy of the number of aircraft in operation 4. Availability of aircraft at hubs and spokes
***On Time Performance* (IATA,2024)**	1. Information Technology System to Support Optimal On-Time Performance (OTP) 2. Timely Boarding and Deboarding Process 3. Coordination Between Operational Teams to Support Punctuality 4. Coordination Between Flight Crew and Ground Handling Team
Operational Cost Efficiency (Wardiyah ,2017)	1. Procedures to Optimize Operational Cost Management 2. Use of Technology to Reduce Operational Costs (e.g., Automated Check-in and Boarding Systems) 3. Baggage Management System to Support Operational Cost Efficiency 4. Proper Flight Schedule Management to Avoid Operational Cost Waste

Source: (Author, 2022)

RESULTS AND DISCUSSION

Table 4. Respondent Characteristics

No	Respondets Characteristic	Classification	Total	Percentage
1	Age	< 35	61	61%
		36 – 40	16	16%
		41 – 45	11	11%
		>45	12	12%
	Total			**100%**
2	Unit	JKTOG	50	50%
		CARGO	25	25%
		JKTDOM	25	25%
	Total			**100%**
3	Education	Senior High School or equivalent	45	45%
		Bachelor	53	53%
		Master	2	2%
	Total			**100%**

Source: Research Results

Based on Table 4, the respondents in this study were categorized into various age groups: 61 respondents were under 35 years old, 16 respondents were between 36 and 40 years old, 11 respondents were between 41 and 45 years old, and 12 respondents were over 45 years old. The respondents came from different work units, with the highest number from the Operations unit, comprising 50 respondents, followed by the Cargo unit with 25 respondents, and the Domestic unit with 25 respondents. In terms of education, the majority of respondents held a bachelor's degree (53 respondents), followed by those with a high school senior high school or equivalent (45 respondents), and 2 respondents held a master's degree.

Hypothesis Testing

Outer Model

Table 5. Outer Model Calculation Results

	Aircraft Rotation (X3)	Baggage Handling (X2)	Operational Cost Efficiency (Y)	Ontime Performance (Z)	Passenger Handling (X1)
X1.1					0.782
X1.2					0.865
X1.3					0.872
X1.4					0.800
X2.1		0.787			
X2.2		0.853			
X2.3		0.793			
X2.4		0.797			
X3.1	0.816				
X3.2	0.820				
X3.3	0.842				
X3.4	0.861				
Y1.1			0.908		
Y1.2			0.841		
Y1.3			0.922		
Y1.4			0.876		
Z1.1				0.845	
Z1.2				0.868	
Z1.3				0.844	
Z1.4				0.861	

Source: Research Results

Table 5 describes the indicator values for each variable, where the Passenger Handling variable (X1), Baggage Volume variable (X2), Aircraft Rotation variable (X3), Ontime Performance (Z), and Operational Cost Effectiveness (Y) have loading factor values greater than 0.7, indicating that all indicators are valid.

Convergent Validity

Table 6. Convergent Validity (AVE)

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)	Description
Aircraft Rotation (X3)	0.855	0.856	0.902	0.697	VALID

Baggage Handling (X2)	0.824	0.834	0.883	0.653	VALID
Operational Cost Efficiency(Y)	0.909	0.911	0.937	0.787	VALID
Ontime Performance (Z)	0.877	0.879	0.915	0.730	VALID
Passenger Handling (X1)	0.849	0.856	0.899	0.690	VALID

Source: Research Results

The rule of thumb for assessing convergent validity is that the loading factor value should be greater than 0.7 for confirmatory research and between 0.6–0.7 for exploratory research. Additionally, the average variance extracted (AVE) value should be greater than 0.5. The analysis results show that each variable has a value greater than 0.5, indicating that the research is considered VALID.

Discriminant Validity

Table 7. Convergent Validity (AVE)

	Aircraft Rotation (X3)	**Baggage Handling (X2)**	**Operational Cost Efficiency (Y)**	**Ontime Performance (Z)**	**Passenger Handling (X1)**
X1.1	0.618	0.647	0.596	0.589	0.782
X1.2	0.676	0.655	0.621	0.722	0.865
X1.3	0.688	0.656	0.647	0.720	0.872
X1.4	0.538	0.602	0.560	0.608	0.800
X2.1	0.533	0.787	0.591	0.514	0.680
X2.2	0.613	0.853	0.679	0.615	0.605
X2.3	0.508	0.793	0.449	0.439	0.610
X2.4	0.568	0.797	0.627	0.543	0.604
X3.1	0.816	0.551	0.708	0.704	0.575
X3.2	0.820	0.553	0.621	0.672	0.659
X3.3	0.842	0.565	0.674	0.644	0.637
X3.4	0.861	0.638	0.702	0.700	0.673
Y1.1	0.731	0.672	**0.908**	0.773	0.658
Y1.2	0.676	0.607	0.841	0.719	0.633
Y1.3	0.713	0.715	0.922	0.745	0.682
Y1.4	0.758	0.622	0.876	0.731	0.619
Z1.1	0.736	0.724	0.774	0.845	0.766
Z1.2	0.695	**0.417**	0.697	0.868	0.599
Z1.3	0.675	0.525	0.653	0.844	0.680
Z1.4	0.674	0.574	0.727	0.861	0.671

Source: Research Results

Table 7 shows that most indicators have higher loadings on their target constructs compared to other constructs, thereby supporting discriminant validity. Each indicator demonstrates the highest loading on its respective target construct, with values ranging from a minimum of 0.417 to a maximum of 0.908. Convergent validity is considered acceptable, although the AVE values for some constructs (X2 and X1) are close to the minimum threshold (0.5).

Reliability testing

Table 8. Composite Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Description
Aircraft Rotation (X3)	0.855	0.856	0.902	Reliable
Baggage Handling (X2)	0.824	0.834	0.883	Reliable
Operational Cost Efficiency (Y)	0.909	0.911	0.937	Reliable
Ontime Performance (Z)	0.877	0.879	0.915	Reliable
Passenger Handling (X1)	0.849	0.856	0.899	Reliable

Source: Research Results

Based on the test results in Table 8, the composite reliability values for the variables are as follows: Passenger Handling (X1) at 0.856, Baggage Handling (X2) at 0.834, Aircraft Rotation (X3) at 0.856, On-Time Performance (Z) at 0.879, and Operational Cost Effectiveness (Y) at 0.911. Meanwhile, the Cronbach's Alpha values for Passenger Handling (X1) are 0.849, Baggage Handling (X2) at 0.824, Aircraft Rotation (X3) at 0.855, On-Time Performance (Z) at 0.877, and Operational Cost Effectiveness (Y) at 0.909. These results indicate that all variables are considered reliable, as the composite reliability exceeds 0.7 and Cronbach's Alpha is above 0.6. Therefore, the questionnaire can be regarded as producing stable and consistent measurements.

Inner Model

Table 9. Goodness of Fit

	R Square	R Square Adjusted
Efektifitas Biaya Operasional (Y)	0.786	0.776
Ontime Performance (Z)	0.739	0.731

Source: Research Results

Based on Table 9, the R^2 (R-square) value for the Operational Cost Effectiveness variable (Y) is 0.786 or 78.6%. This indicates that the Operational Cost Effectiveness variable can be explained by Passenger Handling, Baggage Volume, and Aircraft Rotation variables by 78.6%, while the remaining 21.4% is influenced by other variables not covered in this study.

The R^2 value for the On-Time Performance variable is 0.739 or 73.9%, suggesting that On-Time Performance can be explained by Passenger Handling, Baggage Volume, and Aircraft Rotation variables by 73.9%. The remaining 21.6% is influenced by other variables not included in this study.

Table 10. Path Coefficient

	Aircraft Rotation	Baggage Handling	Operational Cost Efficiency	Ontime Performance	Passenger Handling
Aircraft Rotation	1.000	0.692	0.812	0.815	0.761
Baggage Handling	0.692	1.000	0.738	0.662	0.770
Operational Cost Efficiency	0.812	0.738	1.000	0.837	0.731
Ontime Performance	0.815	0.662	0.837	1.000	0.798
Passenger Handling	0.761	0.770	0.731	0.798	1.000

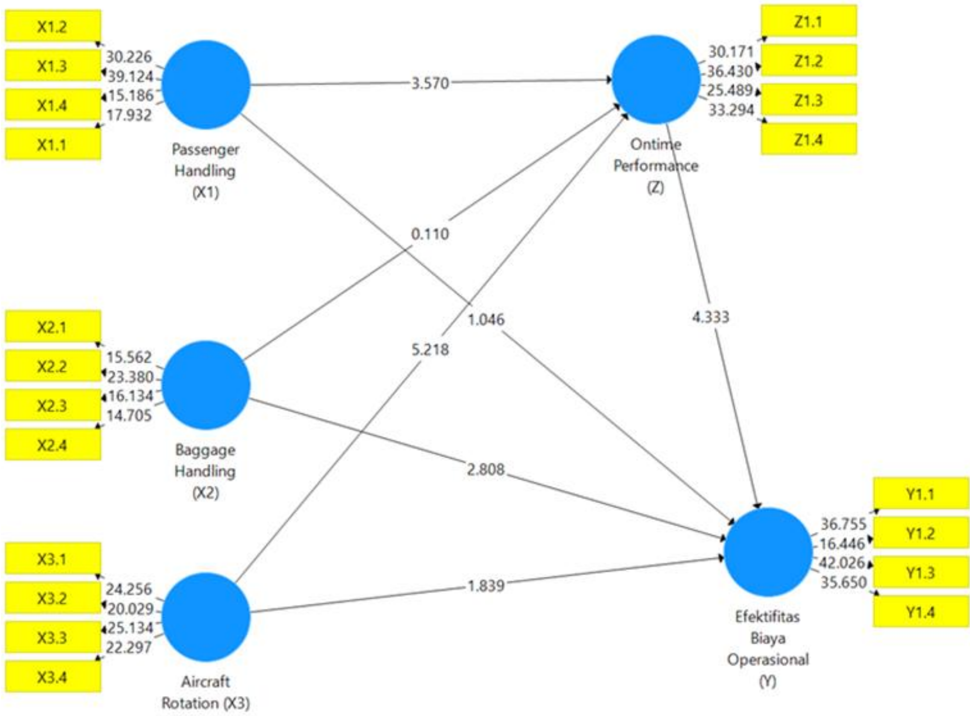
Source: Research Results

Table 11 explains that:

1. **Aircraft Rotation:** Strongest influence on Ontime Performance (0.815), indicating that efficient aircraft rotation significantly enhances punctuality. It also affects Passenger Handling (0.761), reflecting its role in passenger experience.
2. **Baggage Handling:** Strongest influence on Passenger Handling (0.770), showing that efficient baggage management directly impacts passenger satisfaction. It also has a notable effect on Cost Effectiveness (0.738).
3. **Cost Effectiveness:** Strongest influence on Ontime Performance (0.837), suggesting that operational cost efficiency greatly impacts punctuality. It also significantly correlates with Aircraft Rotation (0.812).
4. **Ontime Performance:** Strongest influence on Cost Effectiveness (0.837), indicating that better punctuality improves operational efficiency. Passenger Handling (0.798) also plays a significant role in supporting timely performance.
5. **Passenger Handling:** Strongest influence on Ontime Performance (0.798), highlighting the importance of passenger management in ensuring punctuality. It also shows a meaningful relationship with Baggage Handling (0.770).

Testing of Assumptions

Bootstrapping analysis is used to help determine the statistical significance of path coefficients, covering both direct and indirect effects between variables.



Source: Research Results

Figure 2. Bootstrapping Test Results

The structural relationship model testing aims to provide a comprehensive understanding of the interactions between variables in this study. To achieve this, Partial Least Squares (PLS) analysis was conducted using the bootstrap method, which helps assess the significance of these relationships and ensures the robustness of the model. The following are the results obtained from the analysis.

Table 11. Assumption Test

No	Hypothesis	Analysis	Conclusion

1	The Effect of Passenger Handling on Operational Cost Efficiency	**T-statistic:** 1.046 **P-value:** 0.023 Small negative path coefficient **-0.114**	Since the P-value (0.023) ≤ 0.05, the hypothesis is accepted.
2	The Effect of Baggage Volume on Operational Cost Efficiency	**Path Coefficient**: 0.299 **T-statistic:** 2.808 **P-value:** 0.005	Since the P-value (0.005) ≤ 0.05, the hypothesis is accepted.
3	The Effect of Aircraft Rotation on Operational Costs	**Path Coefficient: 0.288** **T-statistic: 1.839** **P-value: 0.003**	Since the P-value (0.003) ≤ 0.05, the hypothesis is accepted.
4	The Effect of On-Time Performance on Citilink's Operational Cost Efficiency	Path Coefficient: **0.496** **T-statistic:** 4.333 **P-value:** 0.000	Since the P-value (0.000) ≤ 0.05, the hypothesis is accepted.
5	The Effect of Passenger Handling on Operational Cost Efficiency through On-Time Performance	**T-statistic:** 3.570 **P-value:** 0.000 Path Coefficient: **0.429**	Since the P-value (0.000) ≤ 0.05, the hypothesis is accepted.
6	The Effect of Baggage Volume on Operational Cost Efficiency through On-Time Performance	**T-statistic:** 0.110 **P-value:** 0.156 Path Coefficient: **-0.013**	Since the P-value (0.156) ≥ 0.05, the hypothesis is rejected.
7	The Effect of Aircraft Rotation on Operational Cost Efficiency through On-Time Performance	**T-statistic:** 5.218 **P-value:** 0.000 Path Coefficient: **0.497**	Since the P-value (0.000) ≤ 0.05, the hypothesis is accepted.

Source: Research Results

Table 12. Path Analysis

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Aircraft Rotation (X3) -> Operational Cost Efficiency (Y)	0.288	0.281	0.143	2.007	0.023
Aircraft Rotation (X3) -> Ontime Performance (Z)	0.497	0.508	0.094	5.286	0.000
Baggage Handling (X2) -> Operational Cost Efficiency (Y)	0.299	0.318	0.110	2.722	0.003
Baggage Handling (X2) -> Ontime Performance (Z)	-0.013	-0.017	0.117	0.110	0.456
Ontime Performance (Z) -> Operational Cost Efficiency (Y)	0.496	0.489	0.114	4.333	0.000
Passenger Handling (X1) -> Operational Cost Efficiency (Y)	-0.114	-0.120	0.113	1.013	0.156
Passenger Handling (X1) -> Ontime Performance (Z)	0.429	0.426	0.123	3.481	0.000

Source: Research Results

Table 12 Path Analysis shows:

1. **Aircraft Rotation (X3) → Operational Cost Efficiency (Y)**: Positive moderate relationship (0.288) with statistical significance (t-statistic: 2.007, p-value: 0.023) at the 5% level.
2. **Aircraft Rotation (X3) → On-Time Performance (Z)**: Strong positive relationship (0.497) with very high significance (t-statistic: 5.286, p-value: 0.000).
3. **Baggage Handling (X2) → Operational Cost Efficiency (Y)**: Significant positive relationship (0.299) with t-statistic: 2.722, p-value: 0.003.
4. **Baggage Handling (X2) → On-Time Performance (Z)**: Insignificant relationship (-0.013) with t-statistic: 0.110, p-value: 0.456.

5. **On-Time Performance (Z) → Operational Cost Efficiency (Y)**: Strong positive relationship (0.496) with high statistical significance (t-statistic: 4.333, p-value: 0.000).
6. **Passenger Handling (X1) → Operational Cost Efficiency (Y)**: Very small negative relationship (-0.114) with no statistical significance (t-statistic: 1.013, p-value: 0.156).
7. **Passenger Handling (X1) → On-Time Performance (Z)**: Significant positive relationship with t-statistic: 3.481, p-value: 0.000.

Table 13. Indirect Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Aircraft Rotation (X3) -> Efektifitas Biaya Operasional (Y)	0.247	0.242	0.063	3.890	0.000
Aircraft Rotation (X3) -> Ontime Performance (Z)					
Baggage Handling (X2) -> Efektifitas Biaya Operasional (Y)	-0.006	-0.012	0.060	0.106	0.916
Baggage Handling (X2) -> Ontime Performance (Z)					
Ontime Performance (Z) -> Efektifitas Biaya Operasional (Y)					
Passenger Handling (X1) -> Efektifitas Biaya Operasional (Y)	0.213	0.216	0.086	2.480	0.013
Passenger Handling (X1) -> Ontime Performance (Z)					

Source: Research Results

Here's a summary of the indirect effects:

1. **Aircraft Rotation (X3) → Operational Cost Efficiency (Y)**: Positive and significant relationship (coefficient: 0.247, t-statistic: 3.890, p-value: 0.000).
2. **Baggage Handling (X2) → Operational Cost Efficiency (Y)**: Very weak and insignificant relationship (coefficient: -0.006, t-statistic: 0.106, p-value: 0.916).
3. **Passenger Handling (X1) → Operational Cost Efficiency (Y)**: Positive and significant relationship (coefficient: 0.213, t-statistic: 2.480, p-value: 0.013).

Discussion

The discussion is based on the research findings and aims to answer the previously formulated problems. The research hypotheses and explanations are presented using the PLS-SEM method with Smart PLS version 3 software. In general, the study examines the relationships between passenger handling, baggage volume, aircraft rotation, on-time performance, and operational cost efficiency.

1. **The Effect of Passenger Handling on Operational Cost Efficiency**
   Based on the inner model path analysis, it shows that Passenger Handling (X1) does not have a significant effect on Operational Cost Efficiency (Y) because the path coefficient is a small negative value of -0.114, and the p-value is 0.296, which is greater than 5%, indicating that Passenger Handling does not significantly affect Operational Cost Efficiency at the 5% significance level. However, this does not

prove that the effect is nonexistent; it only suggests that the evidence is not statistically strong enough

2. **The Effect of Baggage Volume on Operational Cost Efficiency**
   This relationship is significant with a t-statistic of 2.808 and a p-value of 0.005. The coefficient of 0.299 indicates a significant positive relationship between baggage handling and operational cost efficiency.
3. **The Effect of Aircraft Rotation on Operational Cost Efficiency**
   This relationship shows a coefficient of 0.288, with a t-statistic of 1.839 and a p-value of 0.067. This indicates that, although there is a moderate positive relationship between aircraft rotation and operational cost efficiency, the relationship is not significant at the 5% level because the p-value is greater than 0.05
4. **The Effect of On-Time Performance on Operational Cost Efficiency**
   With a coefficient of 0.496, t-statistic of 4.333, and p-value of 0.000, this relationship is highly statistically significant and shows a strong positive relationship between on-time performance and operational cost efficiency.
5. **The Effect of Passenger Handling on Operational Cost Efficiency Through On-Time Performance**
   This relationship is significant with a t-statistic of 3.570 and a p-value of 0.000, indicating that passenger handling is significantly positively related to on-time performance
6. **The Effect of Baggage Volume on Operational Cost Efficiency Through On-Time Performance**
   The coefficient value is very small (-0.013), with a t-statistic of 0.110 and a p-value of 0.913, indicating that this relationship is not statistically significant. This is because if the baggage volume increases, it can be addressed by using the next available aircraft, avoiding delays and additional operational costs.
7. **The Effect of Aircraft Rotation on Operational Cost Efficiency Through On-Time Performance**
   The relationship coefficient is 0.497, with a very high t-statistic of 5.218 and a very low p-value of 0.000, indicating that this relationship is highly statistically significant.

CONCLUSION

The conclusions drawn from this study are derived from a thorough analysis of the processed data. These findings reflect the outcomes of the data processing conducted and provide insights into the key aspects explored throughout the research.

1. The Influence of Passenger Handling on Operational Cost Efficiency
   There is no significant influence between Passenger Handling and operational cost efficiency (Y). Although a small negative coefficient is observed, the p-value greater than 0.05 indicates that this relationship is not statistically significant.
2. The Influence of Baggage Volume on Operational Cost Efficiency
   There is a significant positive relationship between baggage volume and operational cost efficiency, as indicated by a positive coefficient and a very small p-value (0.005), demonstrating a substantial effect.
3. The Influence of Aircraft Rotation on Operational Cost Efficiency
   Although there is a moderate positive relationship between aircraft rotation and operational cost efficiency, the p-value greater than 0.05 indicates that this relationship is not statistically significant at the 5% level.
4. The Influence of On-Time Performance on Operational Cost Efficiency
   On-time performance has a highly significant influence on operational cost efficiency, as indicated by a high coefficient and a very low p-value (0.000), demonstrating a strong relationship.

5. The Influence of Passenger Handling on Operational Cost Efficiency through On-Time Performance
   Passenger handling has a significant impact on on-time performance, which in turn affects operational cost efficiency. This relationship is highly significant, with a p-value of 0.000.
6. The Influence of Baggage Volume on Operational Cost Efficiency through On-Time Performance
   There is no significant influence between baggage volume and operational cost efficiency through on-time performance, as indicated by a very small coefficient and a p-value greater than 0.05.
7. The Influence of Aircraft Rotation on Operational Cost Efficiency through On-Time Performance
   Aircraft rotation shows a significant relationship with operational cost efficiency through on-time performance, as indicated by a high coefficient and a very low p-value (0.000).

Based on the findings, optimizing baggage management and ensuring high on-time performance (OTP) are crucial for reducing operational costs. The significant impact of baggage volume and OTP on cost efficiency highlights the need to streamline baggage handling processes and maintain punctual flight operations.

Given the strong relationship between OTP and cost efficiency, efforts to improve flight punctuality should be prioritized. Efficient time management can lead to substantial operational cost savings. Additionally, while aircraft rotation does not directly affect cost efficiency, its moderate influence through OTP suggests that enhancing aircraft rotation frequency could indirectly contribute to cost optimization.

Lastly, passenger handling showed no direct impact on operational costs, indicating that its management should focus more on supporting OTP. Efforts such as minimizing passenger wait times and improving passenger flow could enhance overall performance and indirectly support cost efficiency.

The conclusion must be linked to the title and answer the research formulation or objectives. Do not make statements that are not adequately supported by your findings. Write down improvements made to industrial engineering or science in general. Don't create further discussion, repeat abstracts, or simply list research findings. Don't use bullet points, use paragraph sentences instead.

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