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Analysis of The Influence of Maintenance and Service Quality on Baggage Handling System Performance Mediated by Stakeholder Satisfaction at Terminal 3 Soekarno-Hatta International Airport

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Abstract: The growing number of passengers and the increasing volume of baggage require the baggage handling system at Terminal 3 Soekarno-Hatta International Airport to consistently operate at an optimal level and remain readily available at all times. This study aims to examine the influence of maintenance and service quality on system performance, mediated by stakeholder satisfaction with the baggage handling system facilities at Terminal 3 Soekarno-Hatta International Airport. A quantitative approach was employed, utilizing a survey method involving 100 respondents who represent the system's stakeholders. Data analysis was conducted using a structural model approach through Partial Least Squares (SEM-PLS). The findings of the study indicate that maintenance and service quality exert a direct positive influence on system performance and stakeholder satisfaction, and an indirect positive influence on system performance mediated by stakeholder satisfaction. This study found that service quality has a positive effect on stakeholder satisfaction, which is the most dominant statement in the direct influence analysis with a t-statistic value of 3.913. The lowest statement of direct influence is maintenance on system performance with a t-statistic value of 3.156. The most dominant indirect influence statement is maintenance on system performance through stakeholder satisfaction with a t-statistic value of 2.373. System maintenance that is carried out in a timely, preventive and responsive can enhance stakeholder trust and comfort in the system. The higher the quality of maintenance and services provided, the higher the level of stakeholder satisfaction.

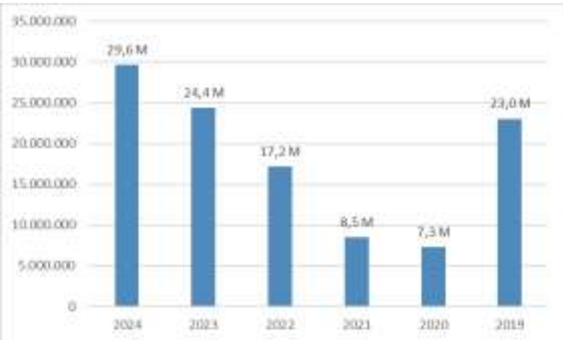
Keywords: Maintenance, Service Quality, Baggage Handling System Performance, Operational Performance, Stakeholder Satisfaction.

INTRODUCTION

Along with the growth of the aviation industry, the number of passengers using air transportation services continues to increase. This can be seen from the number of aircraft movements as well as the number of passengers at airports managed by PT Angkasa Pura Indonesia. One of the airports managed is Soekarno-Hatta International Airport, which consists of Terminal 1, Terminal 2, and Terminal 3. The airport successfully received the Airport Service Quality (ASQ) award in 2024, organized by Airports Council International (ACI), in the category of Best Airport Over 40 million Passengers in the Asia-Pacific region. Angkasa Pura Indonesia recorded a total of 54.8 million passenger movements at Soekarno-Hatta Airport throughout January - December 2024. Terminal 3 itself serves as the operational hub for various airlines, with a total of 34 international airlines and 3 domestic airlines operating routes to and from various international and domestic destinations. Therefore, to support passenger services, particularly at Terminal 3, efficient and reliable facilities are required to enhance overall customer satisfaction.

One of the facilities available at Terminal 3 is the baggage handling system. This system is a type of logistics system installed at airports to automatically transport passenger baggage from the check-in counter to the departure area. Its main functions include baggage check-in, transportation, screening, tracking, sorting, and early storage (Wu & Xie, 2017).

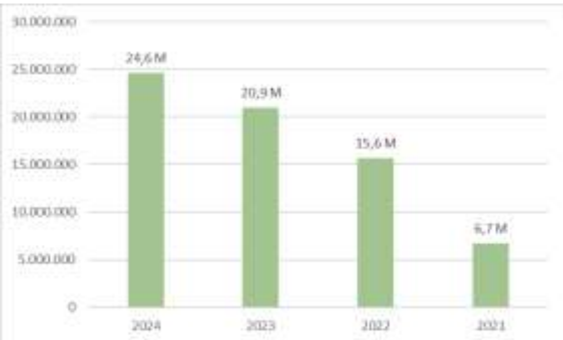
Terminal 3 of Soekarno-Hatta International Airport has recorded significant passenger growth in the post-pandemic period.



Source: BI & Analytics Angkasa Pura Indonesia 2019-2024

Figure 1. Passenger Growth at Terminal 3

The statistical data reveal that passenger movements at Terminal 3 of Soekarno-Hatta International Airport between 2019 and 2024 reached their highest level in 2024, with a total of 29.6 million passengers, reflecting a 22% growth compared to the previous year.



Source: Business Process Intelligence PT. API 2021-2024

Figure 2. Passenger Baggage Data at Terminal 3

The statistical data indicate that passenger baggage processed through the baggage handling system at Terminal 3 of Soekarno-Hatta International Airport between 2021 and 2024 reached its highest level in 2024, totaling 24.6 million baggage items, which reflects a 17% increase compared to the previous year.

The increase in the number of passengers and baggage reflects the full recovery of the aviation sector and operations at Terminal 3 of Soekarno-Hatta International Airport in the post-pandemic period. With the growing volume of passenger baggage, the baggage handling system facilities at Terminal 3 must always operate normally and remain ready for use. Therefore, the system must be available 24 hours a day, 7 days a week. Any downtime of the baggage handling system may result in flight delays, which are unacceptable to passengers (Peng & Zhu, 2017).

Alsyouf et al. (2018) stated that baggage throughput and baggage travel time have a direct relationship. A significant increase in baggage volume results in a higher load on the baggage handling system, which affects baggage travel time as well as equipment conditions. This may be caused by several factors, such as low system reliability, human operational errors, a high number of baggage items entering the Manual Encoding Station (MES), and improper system design.

As Terminal 3 of Soekarno-Hatta International Airport operates 24 hours a day, the baggage handling system must maintain high reliability to support baggage transportation services. Continuous, uninterrupted operation is essential to ensure safe and timely baggage delivery. Any system availability below 100% could lead to flight delays and considerable passenger dissatisfaction (Koenig et al., 2021).

Baggage processing represents a critical task in ensuring the successful operation of air transportation. Failures in this process may trigger cascading events that result in departure delays, unforeseen financial expenditures, and detrimental impacts on the airline's overall performance (Fernandes et al., 2020). Meanwhile, for airlines and airports, the reclaim carousel is a key element in the process that determines the quality of the passenger journey. Failures that result in longer baggage waiting times or even the transfer of baggage to another carousel lead to passenger dissatisfaction and therefore must be avoided (Koenig et al., 2019c). Furthermore, in transfer (connecting) flights, passengers must change aircraft and baggage is transferred to the next flight. A short transfer time between flights means that even the slightest disruption in the baggage handling system can cause a snowball effect (Gupta et al., 2023).

Baggage handling system issues can be classified into unavoidable and avoidable categories. Unavoidable problems are those that occur routinely, with the most frequent being baggage jams caused by items becoming lodged against side guards or conveyor belts. Such occurrences are often attributable to the diverse shapes and dimensions of passenger baggage (Koenig et al., 2019a).

The statistical data indicate an upward trend in error frequency within the baggage handling system between 2021 and 2024, reaching its highest level in 2024 with 21.9 thousand cases, a 24% increase compared to 17.7 thousand cases in 2023. Conversely, in 2021, the number of errors declined to 10.4 thousand, primarily influenced by reduced passenger and baggage volumes as a result of the pandemic at Terminal 3 of Soekarno-Hatta International Airport.

The baggage handling system mostly consists of a series of conveyors connected as a single integrated system, where congestion in any part can affect the entire system. Error frequency is one of the problems that has been proven to occur at various airports that are unable to meet baggage handling demands during peak hours (Kim et al., 2017). Bag jams occurs when system problems are processed too slowly, resulting in an accumulation of unresolved issues. Jams is caused by the unavailability of personnel, machines, or when the baggage volume exceeds the system's capacity, leading to queues and longer waiting times (Toosinezhad et al., 2020).

The handling of each system problem is carried out through several systematic stages. First, personnel must immediately identify the type of error that appears through alarm displays or notifications in the supervisory control and data acquisition (SCADA) system. This system allows unavoidable daily problems to be displayed through visualization, making them part of the daily routine for handling failures. After the error is identified, the second step is that personnel conduct a direct inspection at the location to resolve the system problem, such as bag stuck on the conveyor belt, bag stuck in the x-ray curtain, or bag detected as too high or long by the system. These problems cause bag jams and downtime in the system, which disrupts the baggage handling process flow. Therefore, the airport must provide sufficient personnel to resolve issues as quickly as possible (Koenig et al., 2019a).

The number of equipment replacements from 2020 to 2024 also showed an increase, with the highest figure recorded in 2024 at a total of 6.3 thousand replacements, representing a 14% increase from the previous year in 2023, which had 5.5 thousand replacements. In 2020, there was a decline in the number of equipment replacements in the baggage handling system of Terminal 3, Soekarno-Hatta International Airport, influenced by suboptimal maintenance due to reduced personnel and budget efficiency during the pandemic, with a total of 227 equipment replacements.

The baggage handling system consists of thousands of components, such as transportation system components, control system components, baggage identification system components, baggage inspection system components, and sorting system components. A failure in just one component can cause the entire system to malfunction or operate at reduced capacity. The most common maintenance practice applied to baggage handling systems is time-based maintenance. However, in practice, this approach is often not implemented consistently and tends to shift toward a run-to-break strategy, where repairs are only carried out after a failure occurs. This condition leads to unplanned system downtime, resulting in higher failure costs and passenger inconvenience (Koenig et al., 2019b). Meanwhile, according to Gupta et al. (2023), unplanned downtime may cause baggage to miss the flight or result in flight delays. Furthermore, baggage that misses the flight will require additional logistics at both the departure and arrival airports, thereby increasing baggage transfer costs.

The cost of scheduled maintenance is relatively lower compared to corrective maintenance, as it is planned and anticipated (Drent et al., 2019). Meanwhile, Rodríguez (2020) states that the costs resulting from corrective maintenance are issues that must be avoided in all industrial systems. Implementing corrective maintenance implies expenditures for repairing or replacing damaged machinery and halting production. For service providers, system failures reduce availability or processing capacity, thereby causing delays and longer queuing times.

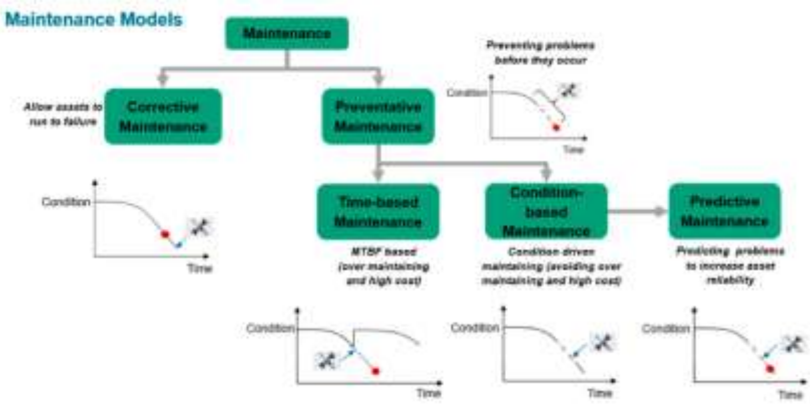
The baggage handling system is a critical component of airport infrastructure. A well-functioning system is essential to ensure the smooth transfer of baggage and to prevent dangerous items from being loaded onto the aircraft. Enhancing service quality through the implementation of automated systems will contribute to the overall efficiency of the aviation sector. (Amardeep, 2018). In addition, the baggage handling system is an essential part of ground handling operations, making a significant contribution to overall passenger satisfaction. (Rezaei et al., 2018).

Peng & Zhu (2017) stated that after-sales service quality has become increasingly important for users of baggage handling systems, with average annual downtime serving as one of the system's key performance indicators. Downtime not only disrupts the smooth operation of airports but can also lead to flight delays that are unacceptable to passengers.

The Baggage Handling System at the terminal frequently experiences error occurrences (Kim et al., 2017; Koenig et al., 2019a; Toosinezhad et al., 2020) and system failures (Gupta et al., 2023; Koenig et al., 2019c, 2019b, 2021; Peng & Zhu, 2017). Therefore, these issues must be addressed promptly and effectively as a strategic step to ensure operational continuity and to prevent disruptions that may result in baggage service downtime and inconvenience for all airport stakeholders. The purpose of this study is to analyze the influence of maintenance and service quality on the performance of the baggage handling system through stakeholder satisfaction at Terminal 3 of Soekarno-Hatta International Airport.

Maintenance

Maintenance is one of the factors with the potential to significantly improve the efficiency of industrial companies. Over time, maintenance has become increasingly important within organizations. In the past, maintenance activities were carried out only in response to equipment failures, and thus were often perceived merely as an obligation performed only when necessary (Mendes et al., 2023).



Source: (Gupta et al., 2023)

Figure 3. Maintenance Categories

Based on the maintenance model above, several types of maintenance can be identified, namely (Gupta et al., 2023):

1. Corrective Maintenance
   Maintenance activities carried out after a failure occurs can be performed either immediately or deferred. Repair actions may be postponed if the failed equipment is non-critical. However, if the equipment is essential for production or operational processes, corrective action must be taken immediately.
2. Preventive Maintenance
   Maintenance activities performed before a failure occurs. Preventive maintenance is carried out based on predetermined time intervals or the perceived condition of the equipment. This preventive action is intended to eliminate failures and costly downtime.
3. Time-Based Maintenance
   In time-based preventive maintenance, inspection and maintenance activities are scheduled regularly in advance. However, this approach carries the risk of inefficiency, such as conducting inspections, repairs, or replacements of components that are still in good condition.
4. Condition-Based Maintenance
   Conceptually, condition-based maintenance focuses on detecting degradation patterns in machine components through routine or even continuous monitoring of condition parameters such as vibration, temperature, pressure, acoustic emissions, and others.

5. Predictive Maintenance
   When condition-based maintenance (CBM) employs statistical tools and machine learning techniques, such as advanced data analytics, regression analysis, trend analysis, pattern recognition, and multivariate correlation, it enables early prediction of potential failures and supports the decision-making process.

Service Quality

Dam and Dam (2021) stated that service quality is defined as the adaptation to client demands in delivering services. Meanwhile, service quality is described as the outcome of the customer's overall evaluation of the service provider by comparing their expectations with the quality they perceive and experience.

The SERVQUAL concept introduced by Parasuraman, Zeithaml, and Berry (1985) initially employed ten dimensions of service quality, consisting of tangibility, reliability, responsiveness, competence, courtesy, credibility, security, access, communication, and understanding. In their subsequent work, Parasuraman et al. (1988) refined these ten dimensions into five dimensions within the SERVQUAL survey instrument (Friska Mastarida, 2023).

System Performance

The system performance referred to here is operational system performance. According to (Sobandi & Kosasih (2014); Alam & Santosa, 2022), operational performance can be defined as the alignment of processes and the evaluation of a company's internal operations in terms of cost, customer service, product delivery to customers, quality, flexibility, and the process quality of goods or services. Meanwhile, Truong et al. (2017) stated that operational performance refers to a company's ability to reduce management costs, order lead times, and deadlines, as well as to improve the efficiency of raw material usage and distribution capacity. Operational performance is crucial for companies as it helps enhance the effectiveness of production activities and produces high-quality products, ultimately increasing company revenue and profit. The indicators of operational performance include safety (work accidents), service level, quality, and productivity (Tortorella et al., 2020).

Baggage Handling System

The baggage handling system at the airport is an automated conveyor network designed to transport baggage from the check-in area to the make-up area. The process begins when passengers place their baggage on the check-in conveyor for weighing and labeling. After this initial stage, the baggage moves along the conveyor line, passing through an automatic label reader for identification, as well as an x-ray machine for security screening. If no further process is required, the baggage will be sent directly to the carousel as the final stage of the handling system. However, if additional inspection is necessary, such as manual label reading or advanced security screening, the baggage will be directed to a designated area equipped with additional personnel for further handling (Kim et al., 2017).

According to Yuliana (2014), baggage handling procedures in the aviation industry have generally been systematically regulated to create standardized practices across airlines. These procedures cover a series of processes and regulations for both the dispatch and receipt of baggage, from the departure station to the destination station. The process begins with a security check, baggage weighing, labeling, and the issuance of a baggage claim tag. If the baggage weight exceeds the predetermined limit, passengers are required to pay an additional fee before the baggage is loaded onto the aircraft. Upon arrival at the destination airport, baggage is unloaded from the aircraft by ground staff and transported to the baggage claim area. When retrieving their baggage, passengers must present and match the claim tag number provided to verify ownership.

According to the Airport Development Reference Manual Chapter U (2004, pp. 573–574), the baggage handling system can be classified into three categories: A, B, and C. Category A airports have a passenger baggage capacity of less than 999 bags per hour and may use either manual sorting, such as rotating sortation (carousel), or automatic sorting, such as pusher or vertisorter systems. Redundancy in this category is provided manually through operators during system downtime or automatically by handling up to 50% of baggage flow at any given time. Category B airports, on the other hand, handle between 1,000 and 4,999 bags per hour and utilize automatic sorting systems such as pusher or vertisorter, linear drive tilt tray sorter, or Destination Coded Vehicle (DCV) type 1. These systems are supported by an automatic redundancy capable of covering 75% of baggage flow during peak hours. Finally, Category C airports manage more than 5,000 bags per hour and are equipped with advanced automatic sorting systems, including multi-tilt tray sorters or Destination Coded Vehicle (DCV) type 2, with redundancy designed to maintain 75% of the flow during peak operational periods.

Stakeholder Satisfaction

Kotler & Keller (2021, p. 89) stated that satisfaction is a person's feeling of pleasure or disappointment resulting from comparing the perceived performance (or outcome) of a product or service with their expectations. If the received service or performance falls below expectations, customers will feel dissatisfied. Conversely, if the service meets expectations, customers will feel satisfied. However, if the service exceeds expectations, customers are likely to experience high satisfaction or even delight. Meanwhile, stakeholder satisfaction refers to the level of satisfaction of a group or individual, measured by comparing the outcomes achieved with the objectives of a plan, which is also influenced by each stakeholder's perspective (Trisnawati et al., 2018).

According to Schaar & Sherry (2010), airport stakeholders consist of: passengers, air carriers, general aviation users, airport organization, Investors, and bond-holders, concessionaires, service providers (passenger handling (check-in) and baggage handling and sorting personnel), employees, federal government, local government, communities affected by airport operations, NGOs, such as environmental bodies, business, commerce, tourism, arts, sports, and education organizations, parking operators and ground transportation providers, airport suppliers.

Research Gap

Previous research has not examined maintenance, service quality, system performance, and stakeholder satisfaction together, and studies focusing specifically on service quality and satisfaction in baggage handling systems remain limited (Amardeep, 2018; Aziz & Syaputra, 2024; Fatimah & Fatmayati, 2023; Rezaei et al., 2018; Satria & Dwi, 2022). Meanwhile, no studies have specifically examined the variables of maintenance and system performance within the scope of baggage handling systems. Gao et al. (2023) stated that there is still limited research providing an in-depth examination of operational smoothness and overall satisfaction with airport baggage handling systems. A similar point was made by Rezaei et al. (2018), who noted that although some studies have examined airline service quality, few have specifically addressed the critical aspects of baggage handling systems. The proposed suppositions:

H_1 : There is a significant influence of maintenance on system performance
H_2 : There is a significant influence of service quality on system performance
H_3 : There is a significant influence of maintenance on stakeholder satisfaction
H_4 : There is a significant influence of service quality on stakeholder satisfaction
H_5 : There is a significant influence of maintenance on system performance through stakeholder satisfaction
H_6 : There is a significant influence of service quality on system performance through stakeholder satisfaction

METHOD

This study was conducted in April 2025. Data were collected by distributing questionnaires to respondents who use the baggage handling system equipment at Terminal 3 of Soekarno-Hatta Airport.

The population of this study consists of passenger handling (check-in) and baggage handling and sorting personnel (Schaar & Sherry, 2010). The number of passenger handling (check-in) personnel is 553, and the number of baggage handling and sorting personnel is 724, resulting in a total study population of 1,277 personnel.

In this study, the sample size was calculated using the formula developed by Slovin (1960) (Umar, 2013, p. 78). Thus, the sample size for this study, based on the calculation above, was 93 respondents; however, the study used a sample of 100 respondents.

The analysis in this study employed the structural equation modeling (SEM) method, which consists of the measurement model (outer model) and the structural model (inner model). This method was conducted using SmartPLS (Partial Least Squares) version 4.1.0.9. (Ghozali dan Latan (2015); Ermawati, 2018) explained that PLS (Partial Least Squares) is a soft modeling analysis method because it does not assume that data must be measured on a specific scale, meaning that the sample size can be small (below 100 samples). Furthermore, this method allows researchers to analyze complex models with multiple constructs, indicator variables, and structural paths without imposing distributional assumptions on the data (Hair et al., 2019).

RESULTS AND DISCUSSION

Hypothesis testing includes both direct and indirect effect tests. These tests are used to evaluate the research hypotheses. Significance testing is employed to assess the impact of independent variables on dependent variables. The hypothesis testing was conducted at a 5% significance level (t-value = 1.96).

Table 1. Direct Effect Test Result

No	Hypothesis	Original Sample (O)	T Statistics (O/STDEV)	P Values	Note
1	Maintenance → System Performance	0.339	3,156	0,002	Accepted
2	Service Quality → System Performance	0.335	3,172	0.002	Accepted
3	Maintenance → Stakeholder Satisfaction	0.361	3,192	0.001	Accepted
4	Service Quality → Stakeholder Satisfaction	0.432	3,913	0.000	Accepted

The analysis results lead to the following conclusions :

a. Hypothesis 1: Impact of Maintenance Variable on System Performance Variable

The results of hypothesis 1 testing indicate that the relationship between the Maintenance variable and the System Performance variable has an estimated value of 0.339 (positive), meaning that Maintenance has a positive effect of 0.339 on System Performance. Furthermore, the t-statistic value is 3.156 > 1.96, and the p-value is 0.002 < 0.05, indicating that Maintenance has a significant positive effect on System Performance. This finding supports hypothesis 1, which is therefore accepted. These results are consistent with the studies conducted by Sasitharan, et al. (2020), Mitchell, et al. (2002), Pradnyandari & Purnawati (2019) and Shyong & Mile (2014).

b. Hypothesis 2: Impact of Service Quality Variable on System Performance Variable

The results of hypothesis 2 testing indicate that the relationship between the Service Quality variable and System Performance has an estimated value of 0.335 (positive), meaning that Service Quality has a positive effect of 0.335 on System Performance. Furthermore, the t-statistic value is 3.172 > 1.96, and the p-value is 0.002 < 0.05, indicating that Service Quality has a significant positive effect on System Performance. This finding supports hypothesis 2, which is therefore accepted. These results are consistent with the studies conducted by Nair & Choudhary (2016) dan Wahyu et al. (2024).

c. Hypothesis 3: Impact of Maintenance Variable on Stakeholder Satisfaction Variable

The results of hypothesis 3 testing indicate that the relationship between the Maintenance variable and Stakeholder Satisfaction has an estimated value of 0.361 (positive), meaning that Maintenance has a positive effect of 0.361 on Stakeholder Satisfaction. Furthermore, the t-statistic value is 3.192 > 1.96, and the p-value is 0.001 < 0.05, indicating that Maintenance has a significant positive effect on Stakeholder Satisfaction. This finding supports hypothesis 3, which is therefore accepted. These results are consistent with the studies conducted by Suarjaya & Herlambang (2020), Grum (2017), and Au-Yong et al. (2018), but differ from Oseghale (2014), who found no significant relationship between types of maintenance strategies and satisfaction levels.

d. Hypothesis 4: Impact of Service Quality Variable on Stakeholder Satisfaction Variable

The results of hypothesis 4 testing indicate that the relationship between the Service Quality variable and Stakeholder Satisfaction has an estimated value of 0.432 (positive), meaning that Service Quality has a positive effect of 0.432 on Stakeholder Satisfaction. Furthermore, the t-statistic value is 3.913 > 1.96, and the p-value is 0.000 < 0.05, indicating that Service Quality has a significant positive effect on Stakeholder Satisfaction. This finding supports hypothesis 4, which is therefore accepted. These results are consistent with the studies conducted by Aziz & Syaputra (2024), Lusiah et al. (2019), and Satria & Dwi (2022).

Table 2. Indirect Effect Test Result

No	Hypothesis	Original Sample (O)	T Statistics (O/STDEV)	P Values	Note
1	Maintenance → System Performance → Stakeholder Satisfaction	0.119	2,373	0,018	Accepted
2	Service Quality → System Performance → Stakeholder Satisfaction	0.142	2,241	0,025	Accepted

The conclusions can be drawn from the findings of the indirect effect test presented in table 2.

a. Hypothesis 1: Impact of Maintenance Variable on System Performance Variable Through Stakeholder Satisfaction Variable

The results of hypothesis 1 testing, which examined the indirect effect of Maintenance on System Performance through Stakeholder Satisfaction, show an estimated value of 0.119 (positive). This means that Stakeholder Satisfaction positively mediates the effect of Maintenance on System Performance by 0.119. Furthermore, the t-statistic value is 2.373 > 1.96, and the p-value is 0.018 < 0.05, indicating that Stakeholder Satisfaction significantly mediates the effect of Maintenance on System Performance. This finding supports hypothesis 1, which is therefore accepted. The results of this study are in line with the research of Irsyad et al. (2024) and Harianja et al. (2025).

b. Hypothesis 2: Impact of Service Quality Variable on System Performance Variable Through Stakeholder Satisfaction Variable

The results of hypothesis 2 testing, which examined the indirect effect of Service Quality on System Performance through Stakeholder Satisfaction, show an estimated value of 0.142 (positive). This means that Stakeholder Satisfaction positively mediates the effect of Service Quality on System Performance by 0.142. Furthermore, the t-statistic value is 2.241 > 1.96, and the p-value is 0.025 < 0.05, indicating that Stakeholder Satisfaction significantly mediates the effect of Service Quality on System Performance. This finding supports hypothesis 2, which is therefore accepted. The results of this study are in line with the research of Awang et al. (2023) and Chika (2019).

CONCLUSION

This study analyzed the effect of maintenance and service quality on the performance of the baggage handling system, with stakeholder satisfaction as a mediating variable, at Terminal 3 Soekarno-Hatta International Airport. Based on the analysis results, several conclusions can be drawn as follows:

1. Maintenance has been proven to have a positive and significant effect on system performance. This indicates that the better the implementation of maintenance programs, the higher the speed, accuracy, and reliability of the system in handling baggage.
2. Service quality positively and significantly influences system performance. Effectively implementing service dimensions (reliability, empathy, responsiveness, assurance, and tangibles) can enhance overall system performance.
3. Maintenance exerts a positive and significant impact on stakeholder satisfaction. Ensuring proper and consistent maintenance improves system reliability and contributes to higher stakeholder satisfaction.
4. Service quality has a positive and significant effect on stakeholder satisfaction, with the most dominant influence compared to the other variables. Fast, accurate, and professional service enhances positive perceptions and stakeholder satisfaction.
5. Stakeholder satisfaction serves as a mediating variable in the relationship between maintenance and service quality on system performance. The indirect effects of both maintenance and service quality on system performance are strengthened when accompanied by higher stakeholder satisfaction.

Overall, this study confirms that maintenance and service quality are critical factors influencing the performance of the baggage handling system, both directly and indirectly through stakeholder satisfaction. Therefore, airport management should strengthen continuous maintenance programs and enhance service quality to ensure the system's reliability and operational continuity in supporting airport operations.

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