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Performance Analysis of Terminal Service Officer Staff in Supervising the Land Side of Hang Nadim Batam International Airport

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Abstract

Hang Nadim Batam International Airport is one of the important air gateways in Indonesia that serves the growing passenger traffic. This requires the readiness of land-side facilities supported by optimal supervision by the Terminal Service Officer, in line with the advancement of digital technology. This study aims to analyze the performance of Terminal Service Officer staff in ground-side supervision and the implementation of digital-based Standard Operating Procedures. This study uses a descriptive qualitative method. The data collection technique uses an in-depth interview method of Terminal Service Officer staff, direct observation in the terminal area, and documentation in the form of Standard Operating Procedure document No: PM/BTH-ASS/LO-02 and PM Regulation No. 41 of 2023. The validity of the data is ensured through the integrity of the data from interviews and real-time field observations. The results of the study found that the performance of Terminal Service Officer staff is optimal in maintaining service standards through the use of precision measuring tools and digital reporting systems. The transformation to a digital platform has succeeded in accelerating response time to facility damage and improving data integrity. Management needs to maximize its management strategy during peak hours so that it does not become a decrease in the quality of service due to the surge in passengers in the terminal area.

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1. Introduction

Airports constitute essential transportation infrastructure that supports regional connectivity, passenger mobility, tourism, logistics, and economic activity. In this context, Hang Nadim Batam International Airport serves as an important air transportation gateway for Batam and the Riau Islands, where the quality of terminal services is closely associated with passengers' overall airport experience. Previous research conducted at Hang Nadim Airport has shown that passenger satisfaction is influenced by several service attributes, including check-in services, staff hospitality, comfort, security, cleanliness, information accuracy, online services, and the availability and condition of airport facilities (Angtony et al., 2023). Following the transition of airport operational management to PT Batam International Airport in 2022, maintaining consistent service performance has become increasingly important in supporting the airport's development and service improvement objectives.

Airport service quality is a multidimensional concept encompassing not only the efficiency of passenger-processing activities but also the physical environment, staff interaction, reliability, responsiveness, comfort, security, and overall passenger experience. Empirical evidence from Indonesian airports demonstrates that service orientation and airport service quality contribute significantly to passenger satisfaction and the overall image of an airport (Usman et al., 2023). International evidence similarly indicates that passengers evaluate airport services through interaction quality, service outcomes, convenience, and the

physical service environment, making both operational performance and facility conditions important determinants of their overall experience (Hong et al., 2020). Recent research at Indonesian airports also confirms that tangible facilities, reliability, responsiveness, assurance, and empathy are significant components of airport service performance and are closely associated with passenger satisfaction (Faizal et al., 2025).

The quality of airport facilities is particularly important because passengers interact directly with numerous terminal facilities throughout their journey, including check-in areas, waiting rooms, toilets, escalators, information systems, seating areas, access points, and other public facilities. The availability, functionality, cleanliness, and accessibility of these facilities influence passengers' perceptions of convenience, safety, and service quality. Airport terminal evaluation therefore needs to consider both functional service performance and the broader passenger experience, because deficiencies in physical facilities can negatively affect users' perceptions even when other operational processes are functioning properly (Rodriguez-Valencia et al., 2024). The condition and reliability of terminal facilities consequently require systematic inspection, monitoring, reporting, and follow-up by responsible airport personnel.

One of the operational units closely associated with the supervision of terminal and landside facilities is the Terminal Service Officer (TSO). TSO personnel are generally responsible for monitoring the condition and readiness of facilities within terminal and landside areas, identifying operational deficiencies, documenting findings, and coordinating corrective action with relevant technical or operational units. Research on Terminal Service Officers has demonstrated that the performance of TSO personnel can have a substantial relationship with passenger satisfaction because effective facility supervision helps ensure that facilities remain functional and available to airport users (Yuniarti Arief et al., 2023). Therefore, TSO activities should not be viewed solely as routine inspections but as an integral component of airport service quality management.

Effective landside and terminal supervision also requires timely information, coordination among operational units, appropriate reporting systems, and rapid responses to facility deficiencies. Research concerning airport operation personnel in landside, terminal, and service-improvement functions has demonstrated that access to operational information can improve work efficiency, accelerate decision-making, facilitate daily operational activities, and strengthen service delivery to airport users (Nursyaf et al., 2025). These findings indicate that TSO performance is influenced not only by individual capability but also by the effectiveness of operational procedures, communication systems, supporting technology, coordination mechanisms, and organizational resources.

The increasing expectations of airport users make employee performance an important component of service management. Employee performance reflects the extent to which personnel accomplish assigned duties effectively, accurately, consistently, and in accordance with organizational responsibilities and performance standards. Recent research has shown that work motivation, job satisfaction, work discipline, and the work environment are important factors associated with employee performance, particularly in organizations that provide public services (Osiani et al., 2026). Human resource management practices, including training and development, performance appraisal, employee engagement, competency development, and organizational support, are also important mechanisms for improving both individual and organizational performance (Arfah, 2026). Accordingly, performance analysis is necessary to identify whether employees have performed their responsibilities effectively and to determine aspects requiring managerial or operational improvement.

Performance evaluation is particularly relevant in airport operations because the consequences of inadequate supervision extend beyond customer dissatisfaction. Facility failures, delayed reporting, insufficient coordination, or ineffective follow-up may disrupt passenger movement, reduce comfort, affect service reliability, and potentially create operational risks. Airport service research in Indonesia has consistently demonstrated that service performance and facility quality have significant implications for passenger satisfaction, reinforcing the importance of continuous monitoring and improvement of

operational service delivery (Usman et al., 2023; Faizal et al., 2025). Furthermore, evidence specifically concerning TSO personnel indicates that the effectiveness of terminal facility supervision is closely linked to the quality of services perceived by passengers (Yuniarti Arief et al., 2023).

Based on observations conducted by the researchers at Hang Nadim Batam International Airport from August 1 to September 30, 2025, several terminal facilities were found to be temporarily unavailable or not functioning properly, including damaged toilets and escalators. Such conditions may reduce passenger comfort and indicate the importance of routine and systematic facility supervision. When a facility problem is identified, TSO personnel are expected to document the finding in an operational report and coordinate with the relevant unit so that corrective action can be undertaken. This process illustrates that the effectiveness of terminal supervision depends on the ability of TSO personnel to identify problems accurately, report them promptly, communicate effectively with related units, and monitor the completion of corrective actions.

The observations are consistent with previous studies indicating that airport users pay considerable attention to comfort, cleanliness, security, information availability, and terminal facilities when evaluating airport services. A study conducted specifically at Hang Nadim Airport identified several service dimensions that required continued improvement while also emphasizing the importance of maintaining satisfactory performance in check-in services, hospitality, comfort, security, and hygiene (Angtony et al., 2023). More broadly, improvements in airport service quality have been found to contribute positively to passenger satisfaction and airport image, suggesting that operational personnel responsible for maintaining the service environment have an important role in achieving airport service objectives (Usman et al., 2023).

Despite the growing body of research on airport service quality, passenger satisfaction, and airport operational performance, studies specifically examining the performance of TSO personnel in supervising the landside area of Hang Nadim Batam International Airport remain limited. Previous research at Hang Nadim has primarily focused on passengers' evaluations of airport service satisfaction rather than specifically examining how TSO personnel perform facility supervision activities and respond to operational findings (Angtony et al., 2023). Meanwhile, studies conducted at other Indonesian airports have demonstrated that TSO performance, personnel competency, operational information systems, and effective facility monitoring can contribute to improved service delivery and passenger satisfaction (Yuniarti Arief et al., 2023; Nursyaf et al., 2025).

This research gap highlights the need for a focused analysis of TSO personnel performance at Hang Nadim Batam International Airport, particularly with regard to routine supervision, identification of facility deficiencies, reporting procedures, coordination with related units, responsiveness to operational problems, and compliance with established working procedures. Such an analysis is expected to provide an empirical basis for identifying strengths and weaknesses in current supervisory practices and for developing recommendations related to personnel competency, operational coordination, training, and service improvement. Strengthening these aspects is particularly relevant because effective human resource management and systematic performance evaluation are important mechanisms for improving organizational effectiveness and service outcomes (Osiani et al., 2026; Arfah, 2026).

Based on these considerations, this study aims to analyze the performance of Terminal Service Officer personnel in supervising landside facilities at Hang Nadim Batam International Airport and to identify the operational constraints encountered in carrying out their supervisory responsibilities. The findings are expected to contribute to the improvement of TSO performance, facility supervision effectiveness, and overall airport service quality. Therefore, this study is entitled "Performance Analysis of Terminal Service Officer (TSO) Staff in Supervising the Landside Area of Hang Nadim Batam International Airport."

2. Literature Review

2.1 Airports

An airport can be understood as an integrated transportation node in which aircraft operations, passenger and baggage processing, surface transportation, service

facilities, safety systems, and operational management interact within a coordinated system. Modern airport management therefore extends beyond providing infrastructure for aircraft movements and increasingly emphasizes accessibility, terminal services, passenger-processing efficiency, and the overall travel experience. From a passenger-centered perspective, accessibility, physical facilities, information services, safety, baggage handling, and the quality of departure, arrival, and transfer processes are essential components of airport performance because deficiencies in one component may reduce the effectiveness of the entire passenger journey (Cao et al., 2023).

Airport operations are generally organized through interconnected airside and landside systems. The airside primarily accommodates aircraft-related activities, including runways, taxiways, aprons, aircraft stands, and controlled operational areas, whereas the landside accommodates passenger access, terminal circulation, check-in processes, public facilities, ground transportation interfaces, and passenger movement toward security-controlled areas. The terminal therefore functions as an interface connecting surface transportation with air transportation, requiring coordinated management of passenger flows, queues, check-in resources, security processes, and service facilities. Efficient landside operations are particularly important because congestion or operational deficiencies in check-in, passenger movement, and security-control processes can increase waiting times, operating costs, and passenger discomfort (Adacher & Flamini, 2020).

2.2 Hang Nadim International Airport Batam

Hang Nadim International Airport is an important transportation infrastructure facility serving Batam and supporting the wider economic activities of the Riau Islands. Its strategic position within the Indonesia–Malaysia–Singapore Growth Triangle strengthens its role in passenger mobility, logistics, tourism, investment, and regional economic connectivity. The development and management of Hang Nadim have also entered a public–private partnership framework in which airport infrastructure and services are operated through cooperation between government entities and a business consortium. This management arrangement is intended to strengthen airport infrastructure development, improve service performance, and increase the professional management of passenger and supporting facilities (Zainuddin & Hasanah, 2025).

Recent evidence indicates that the operational development of Hang Nadim should increasingly focus on passenger-oriented service quality rather than solely on physical infrastructure capacity. Airport facilities, service quality, security, and the passenger experience have been found to contribute significantly to passenger satisfaction at Hang Nadim, demonstrating that the performance of terminal facilities and operational services directly influences passengers' evaluation of the airport. Service quality also contributes to passengers' preferences regarding air transportation services operating from Hang Nadim, indicating that airport and airline service attributes jointly influence user perceptions and behavioral decisions (Efandi et al., 2026; Ramdayani, 2026).

2.3 Supervision

Supervision is an essential component of organizational management because it ensures that planned activities are implemented in accordance with predetermined objectives, operational standards, and organizational responsibilities. Within the Planning, Organizing, Actuating, and Controlling (POAC) framework, supervision represents the controlling function through which actual implementation is observed, deviations are identified, and corrective measures are initiated when operational performance differs from established expectations. Effective supervision consequently requires clear performance standards, continuous observation, documented findings, coordination among responsible parties, and systematic follow-up actions (Shafira et al., 2026).

In an airport environment, supervision is particularly important because terminal services depend on the continuous readiness and functionality of facilities used by passengers. Facility supervision involves regular patrols and inspections, identification of malfunctioning equipment, documentation of operational findings, communication with responsible technical units, and verification that corrective measures have been

implemented. Recent airport research has shown that inspection personnel may encounter operational deficiencies such as malfunctioning information systems, damaged equipment, infrastructure problems, or other facility failures that require immediate inter-unit coordination. Accordingly, the effectiveness of airport supervision depends not only on detecting problems but also on the speed and accuracy of reporting, coordination, and corrective follow-up (Haniifah et al., 2026).

2.4 Facilities

Airport facilities constitute the tangible environment through which passengers experience airport services. Their quality can be evaluated through dimensions such as functionality, physical condition, accessibility, cleanliness, comfort, aesthetics, capacity, and operational reliability. Facilities such as waiting areas, seats, air-conditioning systems, toilets, escalators, signage, information displays, self-service equipment, baggage facilities, and passenger circulation areas influence how users perceive the quality and convenience of an airport. Research indicates that both the functionality and aesthetic characteristics of airport facilities significantly contribute to passenger satisfaction and future travel intentions (Roslan et al., 2026).

Facility quality becomes particularly important in passenger waiting and processing areas because passengers remain in direct contact with these facilities for substantial periods during their airport journey. Empirical evidence from Kualanamu International Airport demonstrated that both waiting-room service quality and departure-terminal facilities significantly affected passenger satisfaction, with the combined variables explaining a substantial proportion of the variation in passenger satisfaction. These findings demonstrate that airport facilities should not merely be available but should remain operational, comfortable, sufficient, and responsive to passenger requirements. Continuous inspection and preventive maintenance are therefore essential to minimize facility disruptions and maintain an acceptable level of terminal service (Hidayat et al., 2024).

2.5 Standard Operating Procedures (SOP)

Standard Operating Procedures are structured operational guidelines designed to ensure that repetitive organizational activities are carried out consistently, accurately, efficiently, and in accordance with established standards. SOPs provide employees with clear sequences of activities, responsibilities, decision points, reporting requirements, and expected outcomes, thereby reducing ambiguity and variations in work practices. Empirical research has demonstrated that structured SOP implementation can improve employee efficiency and performance by providing employees with clear guidance regarding the actions required in specific operational circumstances (Satria & Christian, 2024).

The effectiveness of SOPs is particularly important in service organizations because standardized procedures contribute to consistency, responsiveness, accountability, and service reliability. Recent research has demonstrated that SOP implementation, employee training, and job satisfaction significantly influence service quality, suggesting that written procedures must be accompanied by adequate employee understanding and competence. Within airport operations, SOPs are therefore necessary to guide routine inspections, documentation, operational reporting, escalation of facility problems, communication with other units, and follow-up activities. Consistent implementation of these procedures is essential because airport services involve multiple operational units whose activities must remain coordinated under normal and emergency conditions (Belinda et al., 2025; Hidayatullah & Widagdo, 2024).

2.6 Performance

Employee performance refers to the extent to which personnel complete assigned responsibilities in accordance with established organizational expectations. Performance can be reflected through the quality and quantity of work, timeliness, effectiveness, independence, responsiveness, accuracy, and consistency in completing assigned duties. In service-oriented organizations, employee performance is also influenced by organizational factors such as communication, coordination, work environment, clarity of duties, and managerial support. Recent empirical findings demonstrate that effective interpersonal communication and a supportive work environment positively contribute to employee performance because they facilitate task coordination, information exchange, feedback,

and effective problem solving (Hidayat et al., 2026).

Performance evaluation is important because it provides evidence regarding the degree to which employees successfully perform their duties and identifies areas requiring improvement. In operational settings, performance should therefore be assessed not only from final outcomes but also from the quality of the processes used to achieve those outcomes, including compliance with procedures, responsiveness to operational problems, accuracy of documentation, and coordination with other units. In the airport context, performance assessment becomes particularly important for personnel responsible for facility inspection because their ability to identify abnormalities, report findings, and coordinate repairs can directly affect service continuity, terminal readiness, and passenger comfort (Haniifah et al., 2026).

2.7 Terminal Service Officer

A Terminal Service Officer (TSO) is an operational officer whose responsibilities are closely associated with monitoring terminal conditions and supporting the readiness of passenger service facilities within the landside and terminal areas. The TSO function includes routine inspections of terminal facilities, identification of facility deficiencies, recording operational findings, reporting problems, and coordinating with relevant technical or operational units for corrective action. Recent research on TSO inspection activities has demonstrated that terminal facility supervision is conducted through routine monitoring to ensure that airport facilities remain functional and capable of supporting passenger activities in accordance with operational requirements (Riyanda & Syaputra, 2026).

TSO performance can therefore be evaluated through indicators such as work quality, work quantity, timeliness, effectiveness, independence, inspection consistency, reporting accuracy, responsiveness, coordination, and compliance with applicable procedures. Terminal facility problems may include malfunctioning self-check-in equipment, escalator failures, infrastructure leakage, information-system problems, or other conditions that may reduce passenger comfort and disrupt terminal operations. In such circumstances, TSO personnel function as an important operational link between the identification of a facility problem and the technical unit responsible for corrective action. Effective TSO performance therefore requires both technical awareness of terminal facilities and strong communication and coordination capabilities (Riyanda & Syaputra, 2026; Hidayatullah & Widagdo, 2024).

2.8 Passengers

Passengers are the primary users of airport terminal services and constitute an important stakeholder group in evaluating airport operational performance. Contemporary airport research views passengers not merely as transportation users but as customers whose experiences are shaped by interactions with facilities, employees, information systems, technologies, waiting processes, security procedures, and the physical terminal environment. Passenger satisfaction is therefore formed through a cumulative assessment of service encounters throughout departure, arrival, and transfer processes. The quality of airport services can subsequently influence passengers' behavioral intentions, including their willingness to reuse, recommend, or positively evaluate airport services (Hong et al., 2024).

Passenger perceptions are particularly relevant when evaluating terminal services because users directly experience the operational consequences of facility quality and service performance. Functional and aesthetically appropriate airport facilities have been shown to strengthen passenger satisfaction and future travel intentions, while the availability and quality of waiting-room and departure facilities significantly influence passengers' overall service evaluations. Passenger satisfaction can therefore be used as an important outcome indicator when assessing whether airport facilities and operational services meet users' expectations. Consequently, effective supervision by airport operational personnel, including TSO staff, contributes indirectly to passenger satisfaction by ensuring that terminal facilities remain functional, safe, comfortable, and available throughout airport operations (Hidayat et al., 2024; Roslan et al., 2026).

3. Research Methods

3.1 Research Design

This study employed a descriptive qualitative approach to obtain an in-depth

understanding of the performance of Terminal Service Officer (TSO) personnel in supervising the landside area of Hang Nadim Batam International Airport. A qualitative approach was considered appropriate because the study focused on understanding operational activities, employee experiences, supervisory practices, facility conditions, and coordination processes within their actual organizational setting rather than measuring relationships among variables statistically. Qualitative research is particularly suitable for investigating contextualized phenomena in natural settings because it emphasizes meaning, participant perspectives, situational context, and the interpretation of real-world experiences (Abdalla et al., 2026).

The study specifically examined how TSO personnel performed their responsibilities in monitoring landside and terminal facilities, identifying facility deficiencies, reporting operational problems, coordinating with related units, and following up on identified problems. The qualitative design enabled the researcher to investigate not only what occurred during facility supervision but also how TSO personnel interpreted their duties, responded to operational problems, and implemented supervisory procedures in daily airport operations. Recent qualitative studies have similarly demonstrated that contextual organizational phenomena can be investigated effectively through a combination of interviews, observation, and documentary evidence (Rakhmat et al., 2026).

3.2 Research Location and Period

The research was conducted at Hang Nadim Batam International Airport, Batam, Indonesia, from August 2025 to February 2026. The airport was selected because it provided direct access to the operational setting in which TSO personnel conduct terminal and landside facility supervision. The research location also enabled the researcher to observe facility conditions, supervisory activities, reporting mechanisms, and coordination between TSO personnel and other operational units directly within the environment in which these activities normally occur.

The selection of a specific research setting in qualitative research should be based on its relevance to the phenomenon being investigated and its ability to provide information-rich observations and participants. Accordingly, Hang Nadim Batam International Airport served as the research setting because TSO personnel at this location were directly involved in the supervisory activities that constituted the primary focus of the study. Purposeful selection in qualitative research enables researchers to concentrate on cases, settings, or participants that possess direct experience and knowledge relevant to the research objectives (Ahmad & Wilkins, 2025).

3.3 Data Sources

The study used both primary and secondary data. Primary data were obtained directly from field observations and interviews with TSO personnel at Hang Nadim Batam International Airport. The observational data were generated by examining landside and terminal facilities as well as the supervisory activities performed by TSO personnel, while the interview data provided information regarding personnel responsibilities, supervisory procedures, operational constraints, facility problems, reporting mechanisms, and coordination with related units.

Secondary data consisted of operational documents and other supporting records relevant to TSO activities, particularly TSO daily reports, archival records, facility-related documentation, and photographic evidence obtained during the research period. Documentary evidence was used to complement field observations and interview findings by providing recorded information concerning facility conditions, identified deficiencies, supervisory activities, and operational follow-up. Document analysis is valuable in qualitative research because organizational records and archived materials can provide contextual and evidentiary information that complements data obtained directly from participants and field observations (Morgan, 2022).

3.4 Data Collection Techniques

Data were collected through participant observation, semi-structured interviews, and documentation. The combination of these techniques was intended to obtain comprehensive information concerning the performance of TSO personnel from multiple forms of evidence. The use of multiple qualitative data collection techniques allows researchers to examine organizational phenomena from different perspectives and

strengthens the contextual depth of the resulting data (Abdalla et al., 2026).

3.4.1 Participant Observation

Participant observation was conducted by directly engaging with and observing daily activities related to landside and terminal supervision at Hang Nadim Batam International Airport. During the observation process, attention was directed toward the condition and functionality of airport facilities, routine TSO inspections, the identification of damaged or malfunctioning facilities, reporting procedures, communication with related units, and follow-up actions. The researcher's direct involvement in the operational environment provided opportunities to understand how supervisory activities were performed under actual working conditions rather than relying exclusively on retrospective interview accounts.

Observation also enabled the researcher to compare formally described procedures with their implementation in everyday operations. Field observations were documented systematically to identify recurring patterns, operational constraints, facility problems, and responses undertaken by TSO personnel. Contemporary qualitative research emphasizes that direct observation provides important contextual evidence concerning actual practices and may complement information obtained from interviews and documents (Abdalla et al., 2026).

3.4.2 Semi-Structured Interviews

Semi-structured interviews were conducted with TSO personnel who were directly involved in supervising the terminal and landside areas of Hang Nadim Batam International Airport. This interview format was selected because it provides a predetermined thematic structure while allowing the researcher to ask follow-up questions and explore relevant issues emerging during the interview. Semi-structured interviews are particularly useful for investigating participants' experiences and interpretations because they combine consistency across interviews with sufficient flexibility to explore issues in greater depth (Junnier, 2024).

An interview guide was used to ensure that the discussions remained aligned with the research objectives. The main topics included TSO responsibilities, implementation of facility supervision, inspection procedures, reporting mechanisms, responses to damaged facilities, coordination with related units, operational constraints, compliance with established procedures, and perceptions of TSO performance. The use of a structured interview protocol together with flexible questioning has also been adopted in recent qualitative research to obtain in-depth information while maintaining consistency across participants (Abdillah et al., 2026).

3.4.3 Documentation

Documentation was used as the third data collection technique. The researcher examined documents associated with the daily operational activities of TSO personnel, particularly daily reports containing information on facility inspection findings, operational conditions, facility damage, reported problems, and follow-up actions. Supporting photographs and relevant archival records were also used where available to provide additional evidence concerning observed facility conditions.

Documentary data were not treated merely as supplementary material but were systematically compared with observations and interview statements. This approach helped determine whether reported supervisory activities and facility problems were consistent across different forms of evidence. The systematic examination of organizational documents can strengthen qualitative research by providing historical, administrative, and contextual evidence that may not be fully captured through interviews alone (Morgan, 2022). Recent English-language research published in the *Journal Social Society* has similarly combined semi-structured interviews with systematic document analysis to strengthen qualitative institutional investigations (Abdillah et al., 2026).

3.5 Data Validity and Triangulation

The trustworthiness of the findings was strengthened through methodological triangulation. In this study, data concerning the same research phenomenon were obtained through participant observation, semi-structured interviews, and documentation. Findings generated from one technique were compared with evidence obtained through the other techniques to identify convergence, inconsistencies, and complementary

information.

Triangulation is important in qualitative research because combining multiple forms of evidence can improve credibility by reducing dependence on a single source or method of data collection. Methodological triangulation involving interviews, observations, and documents allows researchers to examine whether interpretations are consistently supported across different forms of empirical evidence (Schlunegger et al., 2024). Credibility in qualitative research can also be strengthened through prolonged engagement, systematic documentation, triangulation, reflexivity, and transparent analytical procedures (Ahmed, 2024).

The triangulation procedure was performed by comparing the researchers' observations of facility conditions and TSO supervisory activities with information obtained from TSO interviews and records contained in daily operational reports. For example, when damaged or malfunctioning facilities were observed, the researcher examined whether the condition had been recorded in the TSO daily report and explored through interviews how the problem had been reported, coordinated, and followed up. This process provided a stronger evidentiary basis for evaluating TSO performance than relying on a single data collection technique.

The methodological strategy used in this study is also supported by recent qualitative research published in the *Income Journal of Economics Development*, which combined interviews, observation, and documentation and applied triangulation to strengthen the validity of qualitative findings (Rakhmat et al., 2026).

3.6 Data Analysis

The qualitative data analysis was conducted concurrently and iteratively throughout the research process. Data obtained from interviews, observations, and documentation were initially organized according to the research focus and subsequently examined to identify information related to TSO performance, facility supervision, operational problems, reporting processes, coordination mechanisms, and follow-up activities. Qualitative analysis is inherently iterative because researchers continuously move between raw data, coding, interpretation, emerging patterns, and contextual understanding rather than treating analysis as a single activity performed only after data collection has been completed (Abdalla et al., 2026).

The analytical process consisted of three interrelated activities: data reduction, data display, and conclusion drawing and verification. During data reduction, relevant interview statements, observational records, and documentary evidence were selected, categorized, condensed, and organized according to the research objectives. Irrelevant or repetitive information was excluded while significant findings related to TSO performance and landside supervision were retained for further analysis.

The reduced data were subsequently presented in an organized narrative form and, where necessary, through matrices or categorized summaries to facilitate comparison among observations, interview findings, and documentary evidence. Systematic organization and coding are important in qualitative analysis because they allow researchers to move from extensive raw data toward identifiable patterns, categories, and meaningful findings while maintaining analytical transparency (Bingham, 2023).

The final stage involved conclusion drawing and verification. Preliminary interpretations were continuously checked against interview transcripts, observational findings, daily reports, and supporting documentation to ensure that the conclusions were supported by the available evidence. Conclusions were refined whenever inconsistencies or additional information emerged during the comparison process. A similar interactive approach involving interviews, observation, documentation, triangulation, and systematic qualitative analysis has been applied in recent qualitative organizational research published in the *Income Journal of Economics Development* (Rakhmat et al., 2026).

Through these analytical procedures, the study sought to develop a comprehensive interpretation of the performance of Terminal Service Officer personnel in supervising the landside area of Hang Nadim Batam International Airport, including the effectiveness of supervisory activities, handling of facility deficiencies, reporting and coordination practices, and operational constraints encountered during the implementation of their responsibilities.

4. Results and Discussion

This study examined the performance of Terminal Service Officer (TSO) personnel in supervising the landside area of Hang Nadim Batam International Airport during the research period from August 2025 to February 2026. Data were obtained through in-depth interviews, direct observation, and documentation, including daily operational reports and internal inspection records. The findings were analyzed according to four main dimensions of employee performance: quality of work, quantity of work, work relationships, and work resilience. In addition, the study examined the condition of landside facilities and the implementation of operational procedures related to inspection, reporting, coordination, and follow-up actions.

4.1 Performance of Terminal Service Officer Personnel

4.1.1 Quality of Work

The findings indicate that TSO personnel demonstrated an adequate level of technical competence in conducting inspections of terminal facilities. The quality of work was reflected not merely in the completion of inspection activities but also in the accuracy of measurements and the personnel's understanding of the equipment used during supervision. One informant explained that temperature measurements using an infrared thermometer should not be taken directly below an air-conditioning diffuser because this position may produce an extreme reading that does not accurately represent the thermal condition of the surrounding terminal area.

A similar level of technical attention was observed in the use of a lux meter for measuring illumination. TSO personnel considered the measurement position and the direction of light reflection before recording the results. These practices indicate that personnel understood that measurement accuracy was essential because temperature and lighting records were subsequently used as operational information for terminal facility monitoring. Therefore, the quality of TSO work was associated with both the ability to operate inspection equipment and the accuracy of data recorded during field activities.

The importance of reliable inspection data is consistent with contemporary airport facility-management research, which emphasizes that operational decisions depend on accurate, standardized, and systematically integrated facility information. Data-based airport facility management can strengthen monitoring, collaboration, and decision-making by ensuring that operational information reflects actual infrastructure conditions (Moon et al., 2025).

Quantity of Work

In terms of work quantity, the results showed that TSO personnel generally conducted routine patrols at least three times during each shift. Under normal operational conditions, these patrols enabled personnel to cover terminal and landside facilities systematically. Nevertheless, the actual quantity and depth of inspection activities were influenced by operational conditions, particularly fluctuations in passenger volume and flight disruptions.

During periods of passenger congestion or flight delays, personnel mobility was reduced because TSO staff also needed to monitor passenger movement and maintain the orderliness of terminal areas. Consequently, personnel had less time to conduct detailed physical inspections of individual facilities. This finding indicates that work quantity in an airport environment cannot be interpreted exclusively according to the number of patrols completed; it must also consider operational workload, passenger density, accessibility of inspection areas, and the complexity of situations encountered during a shift.

Clear work systems and task arrangements are important for maintaining employee productivity when operational responsibilities involve multiple activities. Recent evidence indicates that job clarity and an effective work system positively influence employee productivity because employees can allocate their time and responsibilities more systematically (Tahir et al., 2026). Accordingly, the patrol frequency observed in this study should be understood in relation to both the formal inspection schedule and the dynamic operational conditions of the airport.

4.1.2 Work Relationships

The findings further demonstrated that coordination among TSO personnel and other airport operational units was supported by digital communication. When facility damage or operational problems were identified, information could be transmitted through WhatsApp groups to relevant personnel and operational units. Photographs, descriptions of

the location, and information concerning the condition of the facility could be shared rapidly, enabling the receiving unit to understand the problem before performing corrective action.

Coordination was also maintained during shift changes through a handover checklist. Unresolved facility problems identified by the outgoing shift remained documented so that the incoming team could continue monitoring their status. This mechanism reduced the possibility that unfinished corrective actions would be overlooked when personnel changed shifts.

Digital communication and integrated information exchange are increasingly important in airport operations because the management of complex facilities requires collaboration among multiple stakeholders and technical units. Integrated airport information systems can improve collaboration by enabling information to be shared across operational functions and by supporting data-driven decision-making (Moon et al., 2025). More broadly, digital transformation in civil airports has been associated with improvements in operational performance, innovation capability, and organizational coordination (Shang et al., 2025).

4.1.3 Work Resilience

The results also indicate a relatively strong level of work resilience among TSO personnel. Staff members continued to report facility abnormalities even when routine patrol activities had been completed. This behavior suggests that personnel did not limit supervisory activities strictly to scheduled inspections but remained attentive to incidental problems encountered during normal terminal operations.

Work resilience was particularly important during periods of high operational pressure, such as passenger congestion, flight delays, and simultaneous facility problems. Personnel were required to maintain inspection responsibilities while responding to changing conditions in the terminal. The availability of mobile digital reporting also facilitated this process because incidental findings could be documented without waiting until the end of the shift.

Employee resilience is increasingly recognized as an important factor in digitally supported work environments because resilient employees are better able to maintain cognitive flexibility and adapt their performance to changing operational requirements. Digital communication technologies can further support this adaptability by facilitating information exchange and work-related interaction (Liang et al., 2025). Managerial capability and organizational adaptability are likewise important for maintaining performance under changing environmental and operational conditions (Firdaus & Mariana, 2026).

4.2 Condition and Supervision of Landside Facilities

4.2.1 Main Terminal Area

Observations conducted from September 1 to September 30, 2025, showed that facility supervision in the main terminal area included temperature, illumination, cleanliness, and the functionality of passenger facilities. TSO personnel used infrared thermometers and lux meters to verify environmental conditions rather than relying exclusively on visual inspection.

Temperature and lighting data were recorded after personnel ensured that measurements represented the actual conditions of the monitored area. This procedure was important because measurement results formed part of daily facility-monitoring records. The observations therefore indicate that supervision of terminal facilities involved both qualitative visual assessment and quantitative measurement.

Toilet cleanliness was also included in routine supervision. Personnel inspected the condition of lavatories and coordinated with the cleaning service unit when cleanliness-related problems were identified. Where physical damage or technical problems were encountered, findings were communicated to the responsible unit for subsequent handling.

The condition of terminal facilities is important because airport users evaluate service performance partly through their direct interaction with physical infrastructure. Recent empirical evidence demonstrates that the condition, functionality, and service quality of airport facilities significantly influence passenger evaluations and satisfaction (Agusinta, 2025). Therefore, systematic inspection of temperature, lighting, sanitation, and other terminal facilities represents an important component of airport service management.

4.2.2 Supervision of Special Passenger Flows and Cargo Areas

TSO supervision was not limited to static physical facilities. Personnel also monitored specific passenger movements and operational areas, including the arrival flow of Umrah passengers and the landside cargo area. During Umrah arrivals, supervision focused on preventing excessive crowd accumulation within passenger pick-up areas and maintaining orderly passenger movement.

Monitoring was also conducted within the cargo landside area to identify potential operational obstacles and verify the functionality of supporting facilities. These findings indicate that landside supervision requires TSO personnel to combine facility inspection with situational monitoring of passenger and logistics movements.

The airport terminal is a dynamic environment in which infrastructure, passengers, operational staff, and service processes interact continuously. Consequently, effective facility management requires operational personnel to respond to both the physical condition of assets and variations in their actual use during airport operations. Reliability-oriented airport facility management similarly emphasizes that the availability of airport facility systems depends on timely monitoring, failure identification, and appropriate maintenance responses (Samarakoon & Asmone, 2026).

4.2.3 Drop-Zone Area and Dynamic Operational Conditions

Outdoor landside areas, particularly the drop-zone and parking interface, were monitored to maintain orderly vehicle and passenger movement. TSO personnel performed additional monitoring when sudden increases in vehicles or passengers occurred. Observations showed that supervision extended from parking and drop-off areas toward terminal waiting areas to ensure that operational problems could be identified throughout the landside passenger flow.

This finding demonstrates that the actual workload of TSO personnel can change rapidly depending on airport traffic conditions. Supervisory activities therefore require operational flexibility rather than rigid adherence to a single inspection pattern. Such adaptability is consistent with recent literature emphasizing that managerial and employee capabilities need to respond dynamically to changing operational environments while maintaining organizational performance (Firdaus & Mariana, 2026).

4.2.4 Continuity of Facility Monitoring Through Shift Handover

The study identified a continuity mechanism for facility problems that could not be resolved within a single shift. Problems requiring further technical handling were recorded in the shift handover checklist so that incoming TSO personnel could continue monitoring their status. This procedure ensured that unresolved issues remained visible to subsequent teams until corrective action was completed.

The handover mechanism represents an important element of operational continuity because airport facility failures may require intervention by technical units whose repair activities extend beyond the working period of the personnel who initially identified the problem. A reliable information-transfer mechanism is therefore necessary to avoid loss of operational information between shifts.

Research on airport maintenance systems similarly indicates that insufficient failure information, maintenance delays, and weak systematic maintenance processes can reduce the availability and reliability of airport facilities. Structured failure records and maintenance-monitoring mechanisms are consequently important for improving facility availability (Samarakoon & Asmone, 2026).

Facility Data Integrity

Another important finding concerned the timing of operational data recording. Observations showed that TSO personnel recorded temperature, illumination, facility conditions, and inspection findings directly during field activities rather than postponing the entire documentation process until the end of the shift.

The use of digital forms and links enabled personnel to record findings at the inspection location. This approach increased the traceability of operational information and reduced dependence on retrospective paper-based recording. Photographic or video evidence could also be attached when the condition was difficult to describe in written form.

The importance of digital inspection documentation is supported by the development of technology specifically designed for airport terminal facility

inspection. A mobile airport facility inspection application has been shown to facilitate damage reporting, provide real-time notifications, track repair status, and improve the effectiveness and efficiency of terminal inspection personnel (Gultom, 2024). The findings at Hang Nadim therefore reflect a broader transition toward digitally supported inspection and facility-management practices.

4.2.5 Implementation of Standard Operating Procedures

The implementation of operational procedures by TSO personnel was reflected in three principal mechanisms: structured reporting, real-time coordination, and shift handover. These mechanisms formed an integrated sequence beginning with the identification of a facility problem and continuing through reporting, coordination, monitoring, and follow-up.

First, facility deficiencies were entered into a digital inspection or checklist system. Reports generally included the location of the problem, a description of the facility condition, the urgency of the finding, and supporting photographic or video evidence when required. This mechanism produced a more structured record of inspection findings and enabled the information to be reviewed by relevant operational personnel.

Second, urgent findings were communicated in real time through digital communication groups involving relevant personnel and operational coordination functions. This mechanism shortened the communication pathway between the personnel identifying a problem and the unit responsible for handling it. Real-time notification and repair-status tracking are important characteristics of digital airport inspection systems because they can improve the responsiveness of maintenance activities (Gultom, 2024).

Third, issues that remained unresolved at the end of a shift were transferred to the next shift through oral and written handover. This ensured that responsibility for monitoring the problem was maintained even when personnel changed. The implementation of these procedures indicates that landside supervision at Hang Nadim relied on a combination of physical inspection and continuous information management.

4.3 Discussion

4.3.1 Technical Quality and Validity of Inspection Data

The findings demonstrate that the performance of TSO personnel should not be evaluated solely on the basis of their physical presence in the terminal. Technical competence in using inspection instruments represents an important component of work quality. Accurate placement of infrared thermometers and appropriate use of lux meters indicate that personnel understood how measurement procedures could affect the validity of recorded information.

This issue is important because inaccurate inspection data may produce an inaccurate representation of the terminal environment and may subsequently affect managerial decisions. Current approaches to smart airport facility management increasingly emphasize standardized, interoperable, and reliable information as a basis for operational decision-making. Integrated airport facility information enables managers to monitor complex infrastructure and coordinate interventions more effectively (Moon et al., 2025).

The use of digital records at Hang Nadim further strengthens this process because measurements can be documented at the point of inspection. The result is consistent with research on airport terminal inspection technology demonstrating that digital applications can improve formal reporting evidence, facilitate maintenance reporting, and provide more effective monitoring information for facility evaluation (Gultom, 2024).

Accordingly, the quality dimension of TSO performance in this study includes two complementary elements: technical competence during physical inspection and reliability in documenting the resulting data. These elements are particularly important because facility-management decisions depend on the quality of the information submitted by frontline inspection personnel.

4.3.2 Work Quantity, Operational Workload, and Responsiveness

The finding that personnel generally conducted at least three patrols per shift demonstrates that inspection activities were routinely performed. Nevertheless, passenger congestion and flight disruptions sometimes restricted mobility and reduced the time available for detailed inspection. This finding illustrates that work quantity in airport

supervision is influenced by operational complexity.

It would therefore be inappropriate to evaluate TSO productivity exclusively according to the numerical frequency of patrols. A patrol conducted during normal passenger conditions is operationally different from a patrol performed while personnel simultaneously manage passenger accumulation, monitor facility problems, and coordinate with other units. The effectiveness of the work system becomes particularly important under such conditions.

Evidence from JSS indicates that job-description clarity and work-system effectiveness have positive and significant relationships with employee productivity, with the work system representing an important determinant of how effectively personnel perform assigned responsibilities (Tahir et al., 2026). In the context of the present study, clearly structured patrols, reporting channels, and responsibilities can therefore help maintain productivity despite fluctuations in operational workload.

Digital reporting also appeared to reduce the administrative burden associated with paper-based documentation. Staff could enter findings through mobile devices and continue patrol activities without carrying extensive paper forms. However, because the present research employed a qualitative design, this finding should be interpreted as an observed improvement in work practicality rather than a statistically demonstrated increase in productivity.

4.3.3 Digital Coordination and Inter-Unit Work Relationships

One of the most significant operational findings was the use of digital communication to coordinate TSO personnel with technical and supporting units. When facility deficiencies were identified, information could be transmitted rapidly with photographs or videos. This reduced the need to rely exclusively on verbal descriptions and provided the receiving unit with more detailed information concerning the nature and location of the problem.

The findings are consistent with contemporary airport digitalization research. Digital transformation has been shown to positively contribute to civil airport performance because technology can enhance information processing, innovation capability, and operational responsiveness (Shang et al., 2025). Integrated airport facility information systems similarly improve stakeholder collaboration by creating a shared information environment for facility management and operational decision-making (Moon et al., 2025).

The findings also support the use of digital tools specifically within airport inspection activities. Gultom (2024) demonstrated that real-time notifications and repair-status tracking can improve the efficiency of facility inspection and maintenance processes. Therefore, the digital reporting practices observed at Hang Nadim may be interpreted as an operational mechanism that strengthens communication between facility inspection and corrective maintenance functions (Gultom, 2024).

Nevertheless, the effectiveness of digital coordination remains dependent on human responsiveness. A rapidly transmitted report will not automatically produce rapid corrective action if the receiving unit lacks personnel, resources, or appropriate prioritization procedures. The findings therefore indicate that digitalization functions as an enabling mechanism rather than as a substitute for effective organizational coordination.

4.3.4 Work Resilience, Integrity, and Operational Adaptability

TSO personnel demonstrated resilience by continuing to monitor facility conditions outside scheduled inspection points and reporting incidental findings when they were encountered. Such behavior is particularly relevant within airport operations because facility deficiencies may occur unpredictably and cannot always be identified through fixed patrol schedules.

Recent research has demonstrated that employee resilience contributes to cognitive flexibility and digital performance, particularly when employees work in environments supported by digital communication technologies. Resilient personnel are better positioned to adapt their work behavior to changing conditions and maintain performance when operational demands fluctuate (Liang et al., 2025).

This interpretation is also supported by the Income Journal of Economics Development, which identifies adaptability, strategic decision-making, innovation management, and managerial capability as important

mechanisms for improving organizational effectiveness in dynamic environments. Digital transformation further strengthens these capabilities by improving operational efficiency and organizational agility (Firdaus & Mariana, 2026).

In the present study, work resilience was visible in the ability of personnel to maintain monitoring activities during high passenger density and to continue documenting facility problems under operational pressure. However, resilience should not be interpreted as justification for excessive workload. Sustainable TSO performance still requires appropriate staffing, clear work allocation, sufficient equipment, and organizational support.

4.3.5 Digitalization of SOP Implementation

The implementation of operational procedures at Hang Nadim demonstrates a transition from predominantly manual documentation toward digitally supported inspection and reporting. This transition appears to have simplified the administrative process by enabling field personnel to enter information directly through electronic forms or links.

The observed digital reporting mechanism has several operational advantages. First, it enables findings to be recorded closer to the time at which they are observed. Second, digital records are easier to retrieve for subsequent monitoring and evaluation. Third, photographs and videos can provide supporting evidence regarding the condition of damaged facilities. Fourth, unresolved findings can remain visible to personnel responsible for subsequent monitoring.

These findings are consistent with airport-specific digital inspection research showing that mobile inspection systems can facilitate facility-damage reporting, monitor maintenance status, issue real-time notifications, and create a centralized source of inspection information (Gultom, 2024). Broader studies of civil airport digital transformation also demonstrate that technological integration can positively influence airport operational performance when technology is aligned with organizational processes and management capabilities (Shang et al., 2025).

The development of integrated facility-information systems at airports also emphasizes the importance of standardized data structures, collaboration, and lifecycle facility management. Digital systems are most beneficial when operational data are integrated and can support subsequent planning, monitoring, and maintenance decisions rather than functioning merely as electronic replacements for paper forms (Moon et al., 2025).

Therefore, the principal benefit of digitalization observed in this study was not simply the elimination of paper documents. Its more important contribution was the improvement of information continuity from inspection to reporting, coordination, shift handover, and follow-up.

4.3.6 Facility Supervision and Implications for Passenger Service

The condition of airport facilities is closely related to the quality of the passenger experience. Although this study did not directly measure passenger satisfaction, the systematic monitoring of toilets, lighting, temperature, passenger circulation, and other landside facilities is operationally relevant because these facilities are directly used or experienced by passengers.

Recent airport research has shown that the quality and functionality of physical facilities influence perceived service quality and passenger satisfaction. Well-maintained airport environments can strengthen the service experience, while deficiencies in physical infrastructure can negatively affect passengers' assessment of airport services (Agusinta, 2025). Airport terminal service research similarly emphasizes that tangible facility conditions represent an important component of passenger perceptions of service quality (Faskhodi et al., 2025).

From this perspective, the role of TSO personnel is not to produce passenger satisfaction directly but to maintain one of the operational conditions that support it. Accurate identification of facility deficiencies, rapid reporting, appropriate coordination, and continuous monitoring contribute to ensuring that terminal facilities remain available and functional.

The importance of systematic facility supervision is also reinforced by recent international airport maintenance research. Facility reliability can be affected by inadequate failure analysis, delayed

maintenance, and fragmented maintenance-management practices, demonstrating the need for structured monitoring and maintenance information (Samarakoon & Asmone, 2026).

4.3.7 Overall Evaluation of TSO Performance

Overall, the findings indicate that TSO personnel at Hang Nadim Batam International Airport demonstrated generally strong performance in landside supervision across the dimensions of work quality, work quantity, work relationships, and work resilience. Technical competence was reflected in the appropriate use of measurement equipment, while routine patrols demonstrated consistent implementation of supervisory activities. Digital communication strengthened coordination with other units, and personnel displayed adaptability in responding to dynamic passenger and facility conditions.

The study also indicates that digitalization has become an important supporting element of TSO performance. Digital inspection checklists, daily reporting links, real-time communication, photographic evidence, and shift-handover mechanisms created a more integrated information flow between inspection and corrective action.

Nevertheless, several operational limitations remain. Passenger congestion and irregular operational situations may restrict personnel mobility and reduce the time available for detailed facility inspections. In addition, effective digital reporting still depends on the responsiveness of related technical units and the availability of sufficient operational resources.

These findings suggest that future improvements should focus on strengthening digital integration, maintaining personnel competency in the use of inspection equipment, optimizing patrol strategies during peak passenger periods, and developing facility databases that can transform daily inspection reports into information for preventive maintenance. This direction is consistent with contemporary smart-airport research emphasizing standardized information, digital transformation, integrated facility management, and data-driven operational decision-making (Moon et al., 2025; Shang et al., 2025).

5. Conclusion

This study concludes that the performance of Terminal Service Officer (TSO) personnel in supervising the landside area of Hang Nadim Batam International Airport was generally effective across four main dimensions: work quality, work quantity, work relationships, and work resilience. TSO personnel demonstrated adequate technical competence in conducting facility inspections, maintaining routine patrol activities, coordinating with related operational units, and responding to facility problems under dynamic airport conditions. The implementation of SOP No. PM/BTH-ASS/LO-02 was also carried out consistently, particularly through structured inspection, real-time reporting, inter-unit coordination, and shift handover mechanisms. The adoption of digital reporting systems reduced dependence on manual documentation and enabled personnel to allocate more attention to physical facility supervision and operational monitoring.

These findings imply that the effectiveness of landside supervision depends not only on personnel competence but also on the availability of efficient reporting systems, clear coordination mechanisms, and continuous monitoring procedures. Therefore, airport management should maintain personnel competency development, strengthen digital integration, and optimize coordination between TSO and technical units to support timely corrective actions and service continuity.

This study is limited by its qualitative design, single-airport setting, limited number of informants, and specific observation period, which restrict the generalizability of the findings. Future research should involve multiple airports, larger samples, longer observation periods, and mixed-method or quantitative approaches to examine the relationship between TSO performance, facility reliability, response time, Service Level Agreement achievement, and passenger satisfaction more comprehensively.

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