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FACTORS INFLUENCING THE ENHANCEMENT OF GROUND SERVICE QUALITY AT TAN SON NHAT INTERNATIONAL AIRPORT 2025

FATORES QUE INFLUENCIAM A MELHORIA DA QUALIDADE DOS SERVIÇOS DE TERRA NO AEROPORTO INTERNACIONAL DE TAN SON NHAT EM 2025

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Abstract
This research examines the determinants that shape ground service quality at Tan Son Nhat International Airport. A survey of more than 540 passengers was carried out between April and June 2025, coinciding with a period of notable increases in domestic airfares. To assess the reliability of the measurement constructs, Cronbach's alpha was applied, followed by Exploratory Factor Analysis (EFA), which identified six core dimensions: interaction quality, facility and environmental quality, layout and environmental quality, service efficiency, accessibility, and perceived value. Multiple regression analysis was then used to determine how these dimensions influence overall ground service quality. The results indicate that all six factors have a significant and positive effect, with accessibility demonstrating the strongest contribution. Drawing from these findings, the study proposes several practical solutions to further enhance ground service quality at the airport.

Keywords: Ground Service Quality. Tan Son Nhat International Airport. Exploratory Factor Analysis.

Resumo
Esta pesquisa examina os determinantes que moldam a qualidade do serviço de solo no Aeroporto Internacional Tan Son Nhat. Uma pesquisa com mais de 540 passageiros foi realizada entre abril e junho de 2025, coincidindo com um período de aumentos notáveis nas tarifas aéreas domésticas. Para avaliar a confiabilidade dos construtos de mensuração, foi aplicado o alfa de Cronbach, seguido por Análise Fatorial Exploratória (AFE), que identificou seis dimensões principais: qualidade da interação, qualidade das instalações e do ambiente, layout e qualidade do ambiente, eficiência do serviço, acessibilidade e valor percebido. A análise de regressão múltipla foi então utilizada para determinar como essas dimensões influenciam a qualidade geral do serviço de solo. Os resultados indicam que todos os seis fatores têm um efeito significativo e positivo, com a acessibilidade demonstrando a contribuição mais forte. Com base nessas descobertas, o estudo propõe diversas soluções práticas para aprimorar ainda mais a qualidade do serviço de solo no aeroporto.

Palavras-chave: *Qualidade do Serviço de Solo. Aeroporto Internacional Tan Son Nhat. Análise Fatorial Exploratória.*

1 INTRODUCTION

The aviation sector continues to play a central role in global economic integration, contributing over $3.5 trillion annually and remaining one of the world's most dynamic industries (ATAG, 2024). In this competitive environment, service quality (SQ) has become a decisive factor shaping passenger satisfaction and airline competitiveness (Hassan & Salem, 2021; Samosir *et al*., 2024). Beyond economic performance, the aviation industry is increasingly required to align with global sustainable development goals (SDGs), particularly in promoting safe, inclusive, and environmentally responsible transportation systems. According to ICAO (2023) and UN SDG reports, improving service quality—including ground operations—is an essential component of sustainable airport management, contributing to SDG 9 (Dinh, 2024a; Dinh, 2024b; Khoi & Dinh, 2025) and SDG 11 (Dinh, 2024c; Dinh, 2024d; Kim & Le Quoc, 2025; Huy *et al*., 2025; Huy & Dinh, 2025a; Huy & Dinh, 2025b; Le Quoc *et al*., 2025).

In Vietnam, Tan Son Nhat International Airport remains the country's busiest aviation hub in 2025, handling the highest volume of domestic and international passengers. However, updated evaluations released in early 2025 show that Tan Son Nhat continues to rank lowest in ground service quality (GSQ) among Vietnam's major airports, with scores indicating that several service dimensions still fall below passenger expectations. Understanding the determinants that influence GSQ is therefore crucial for improving operational performance and enhancing the airport's service reputation.

This urgency is intensified by the current context. Entering 2025, Vietnam's domestic airfares remain at elevated levels following sharp increases in mid-2024 driven by rising fuel prices, exchange-rate fluctuations, and constraints in aircraft supply. These conditions place additional financial pressure on passengers and may negatively shape their perceptions of GSQ at major airports, especially Tan Son Nhat. Furthermore, Vietnam's growing role in hosting international aviation and commercial events in 2025—including follow-up activities after the "Trinity 2024" forum—demands that service quality improvements keep pace with rising expectations from global stakeholders.

Although previous research has examined factors shaping GSQ, many studies were conducted under stable market conditions and have not fully incorporated the influence of perceived value during periods of high airfare volatility. To fill this gap, this

study focuses on the early 2025 context—when fare pressure, passenger expectations, and service performance interact more strongly—and integrates perceived value as a key determinant of GSQ.

2 LITERATURE REVIEW

Research in aviation service quality generally distinguishes between two main categories: in-flight services and ground services (Sricharoenpramong, 2018; Bahar, 2020). Ground services cover all pre-flight and post-flight activities, including passenger processing, baggage handling, aircraft turnaround, and technical preparation (Aviation Plus, 2020). In evaluating GSQ, two foundational models are widely referenced: Gronroos's (1984) functional–technical quality model and the SERVQUAL framework proposed by Parasuraman *et al*. (1985; 1988). These, along with SERVPERF, remain among the most commonly used tools for measuring service quality across sectors (Dike *et al*., 2024).

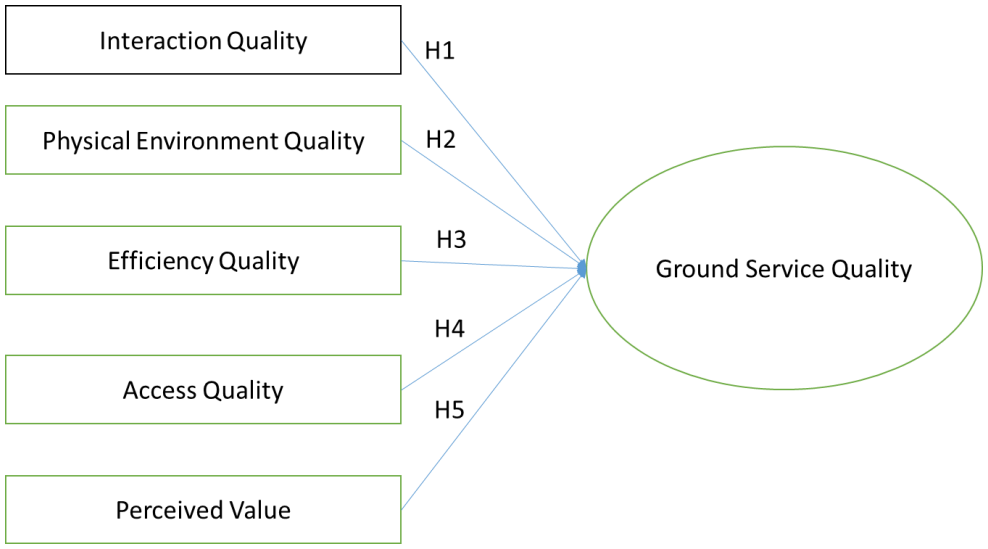
Empirical studies have identified various factors shaping GSQ. Chen and Chang (2005) found that responsiveness, assurance, and tangible elements strongly influence passenger evaluations in Taiwan. Pakdil and Aydin (2007), using SERVQUAL and factor analysis, reported responsiveness as the most influential dimension, with expectations varying by education level and travel behavior. Babbar and Koufteros (2008) showed that staff-related attributes—such as attentiveness, politeness, and efficiency—accounted for a substantial portion of customer satisfaction.

In Southeast Asia, Sricharoenpramong (2017) identified five SERVQUAL-based dimensions affecting GSQ at Don Mueang Airport: reliability, responsiveness, assurance, empathy, and tangibles. Bahar (2020) surveyed airline employees and highlighted the importance of appearance, reliability, and empathy for customer satisfaction and loyalty. In Vietnam, several studies have applied SERVPERF to assess GSQ. At Tan Son Nhat Airport, Truong Quang Dung (2017) emphasized staff performance and tangibles, while Hoang Anh Thu (2022) identified interaction quality, physical environment, efficiency, and accessibility as key drivers. Similar findings were reported at Noi Bai, Dong Hoi, and Phu Bai airports, where service effectiveness and accessibility remained recurring issues (Dang Thi Luong, 2017; Doan Hai, 2018; Tran Xuan Long, 2020).

Drawing on service quality theory and prior evidence—particularly Parasuraman *et al*. (1985) and Hoang Anh Thu (2022)—this study proposes five core determinants of GSQ: interaction quality, efficiency, accessibility, physical environment, and perceived value (Figure 1).

Figure 1

Model of Factors Influencing GSQ.



Source: Authors

Interaction Quality (IQ) refers to the way employees communicate and engage with passengers, including their attitude, professionalism, and ability to resolve problems (Brady & Cronin, 2001; Njoroge, 2023). A positive attitude, strong expertise, and effective problem-solving help improve customer satisfaction and service performance (Purwanto, 2000; Wirtz, 2020). Based on prior findings (Hoang Anh Thu, 2022; Njoroge, 2023), interaction quality is expected to enhance GSQ.

H1: Interaction quality positively affects GSQ.

Physical Environment Quality (PEQ) covers the tangible aspects of service delivery—cleanliness, facilities, comfort, and safety (Elliott *et al*., 1992). Clean and well-maintained areas, modern equipment, comfortable waiting spaces, and effective security measures help create a positive experience (Hussain *et al*., 2015; Ntambi, 2022). Therefore, PEQ is anticipated to improve GSQ.

H2: Physical environment quality positively affects GSQ.

Effectiveness Quality (EQ) represents what customers actually receive from the service, including waiting time and satisfaction (Wu & Cheng, 2013). Shorter queues and

timely, accurate service increase satisfaction and strengthen overall service evaluation (Hoang Anh Thu, 2022). Thus, effectiveness should positively influence GSQ.

H3: Effectiveness quality positively affects GSQ.

Access Quality (AQ) evaluates how easy and convenient it is for customers to access and use airport services. Clear information, simple procedures, and convenient processes lead to a smoother experience and higher satisfaction (Shonk & Chelladurai, 2008; Wu & Cheng, 2013). Hence, AQ is expected to improve GSQ.

H4: Access quality positively affects GSQ.

Perceived Value (PV) reflects how customers judge the value received relative to the price paid. Prior studies show that perceived value significantly shapes service quality evaluations and satisfaction (Lee & Ulgado, 1997; Qin & Prybutok, 2009). When service quality matches or exceeds customer expectations at the given price, evaluations become more positive (Andaleeb & Conway, 2006).

H5: Perceived value positively affects GSQ.

Based on methodological guidelines, the minimum sample size required is 175 for EFA (5 × 35 variables) and 90 for multiple regression (Nguyen Dinh Tho, 2014). The study distributed 550 questionnaires at various airport service areas; after eliminating 10 invalid responses, 540 valid samples were retained for analysis.

Reliability was assessed using Cronbach's Alpha ($\alpha > 0.6$; item–total correlation > 0.3) (Huy & Loan, 2022; Huy *et al*., 2024). EFA was conducted using Principal Axis Factoring with Promax rotation, with criteria including KMO ≥ 0.5, significant Bartlett's test, factor loadings ≥ 0.5, and cumulative variance ≥ 50%. Multiple regression analysis was subsequently employed to examine the effects of the five factors on GSQ.

3 RESULTS AND DISCUSSION

The results indicate that all measurement scales are reliable. Most item–total correlations exceed 0.3, and all Cronbach's Alpha values are above 0.7, confirming that the observed variables are consistent and suitable for subsequent analyses.

Table 1

Results of Measurement Scale Reliability Testing

Factor	Observed Variable	Mean	Standard Deviation	Total Item-Corrected Correlation	Cronbach's Alpha
Interaction Quality (IQ)	IQ1	4.2984	0.8251	0.7612	0.879
	IQ2	4.1527	0.8343	0.7924	0.875
	IQ3	4.0879	0.8428	0.8211	0.87
	IQ4	4.2655	0.7093	0.7887	0.878
	IQ5	4.1768	0.8021	0.7498	0.882
	IQ6	4.0493	0.9547	0.7214	0.884
	IQ7	4.2594	0.8295	0.6951	0.886
	IQ8	4.2136	0.7934	0.7057	0.885
	The Cronbach's Alpha coefficient for the factor: 0.9011				
Physical Environment Quality (PEQ)	PEQ1	4.2873	0.8045	0.7682	0.8784
	PEQ2	4.1648	0.8179	0.7841	0.8751
	PEQ3	4.0952	0.8294	0.8127	0.8716
	PEQ4	4.2531	0.7012	0.1924	0.9063
	PEQ5	4.1839	0.7883	0.7556	0.8802
	PEQ6	4.0614	0.9476	0.7332	0.883
	PEQ7	4.2417	0.8217	0.7039	0.8857
	PEQ8	4.2265	0.7898	0.7146	0.8846
	PEQ9	4.2873	0.8045	0.7682	0.8784
	PEQ10	4.1648	0.8179	0.7841	0.8751
	The Cronbach's Alpha coefficient for the factor: 0.911				
Access Quality (AQ)	AQ1	4.6913	0.7632	0.7618	0.905
	AQ2	4.1286	0.8394	0.8042	0.898
	AQ3	4.1672	0.8241	0.7793	0.902
	AQ4	4.0984	0.8527	0.7926	0.900
	AQ5	4.1327	0.7498	0.6934	0.914
	AQ6	4.1895	0.7286	0.7431	0.907
	The Cronbach's Alpha coefficient for the factor: 0.9211				
Effectiveness Quality (EQ)	EQ1	4.2000	0.7813	0.7206	0.9589
	EQ2	4.1897	0.7682	0.9485	0.8849
	EQ3	4.2828	0.7506	0.8736	0.9101
	EQ4	4.3172	0.7272	0.8684	0.9118
	The Cronbach's Alpha coefficient for the factor: 0.9368				
Perceived Value (PV)	PV1	4.0621	0.7867	0.7927	0.9214
	PV2	4.0655	0.7754	0.7531	0.8621
	PV3	4.1345	0.7754	0.7731	0.8703
	The Cronbach's Alpha coefficient for the factor: 0.9203				
Ground Service Quality (GSQ)	GSQ1	3.9897	0.8297	0.7927	0.8150
	GSQ2	3.9897	0.8000	0.7531	0.8315
	GSQ3	4.1207	0.8039	0.7731	0.8233
	GSQ4	4.2621	0.7349	0.6131	0.8833
	The Cronbach's Alpha coefficient for the factor: 0.8751				

Source: Author's calculation using Stata 17.0 software

After assessing reliability, all observed variables satisfied the required thresholds. The final model includes 5 independent factors: IQ with 7 observed variables, PEQ with 9 observed variables, AQ with 6 observed variables, EQ with 4 observed variables, and

PV with 3 observed variables. In total, 29 observed variables were retained, and these will be further examined for measurement validity through EFA.

Table 2

EFA of Independent Variables

Variable Code	**Factor**						**Factor Name**
	1	**2**	**3**	**4**	**5**		
IQ1	0.8163						**Interaction Quality (IQ)**
IQ2	0.8437						
IQ3	0.7950						
IQ4	0.6777						
IQ5	0.6182						
IQ6	0.6225						
IQ7	0.5265						
IQ8	0.5138						
PEQ1				0.6743			**Physical Environment Quality (PEQ)**
PEQ2				0.7539			
PEQ3				0.7078			
PEQ4				0.7348			
PEQ5				0.6891			
PEQ6				0.7633			
PEQ7				0.5644			
PEQ8				0.7071			
PEQ9				0.6479			
PEQ10				0.7544			
AQ1			0.6707				**Access Quality (AQ)**
AQ2			0.6425				
AQ3			0.6725				
AQ4			0.6388				
AQ5			0.5924				
AQ6			0.7503				
EQ1		0.5872					**Effectiveness Quality (EQ)**
EQ2		0.8420					
EQ3		0.8146					
EQ4		0.8391					
PV1					0.7707		**Perceived Value (PV)**
PV2					0.8386		
PV3					0.8508		
Eigenvalue Value	**14.61**	**1.75**	**1.61**	**1.48**	**1.12**	**1.02**	
Variance Extracted (%)	**50.39**	**56.45**	**62.00**	**67.09**	**70.94**	**75.44**	
Sig. Value of Bartlett's Test	**0.0000**						
KMO Test	**0.9410**						

Source: Author's calculation using Stata 17.0 software

Table 2 shows that the EFA results me*et al*l required criteria. Bartlett's Test is significant (Sig = 0.000), and the KMO value (0.941) confirms sampling adequacy. Five factors with eigenvalues greater than 1 were extracted, explaining 75.44% of the total variance, indicating a strong and valid factor structure.

Table 3

Regression Results

Dependent Variable GSQ	**Regression Coefficient**	**Std**	**t- Value**	**Significance Level**	**Contribution Level**	**VIF**
IQ	0.1412	0.0483	2.924	0.0040***	14.82%	2.11
PEQ	0.1027	0.0427	2.404	0.0170**	10.78%	1.83
EQ	0.2893	0.0461	6.276	0.0000***	30.15%	2.09
AQ	0.0675	0.0379	1.78	0.0760*	6.74%	1.71
PV	0.3246	0.0521	6.228	0.0000***	32.51%	2.94
C	-0.1652	0.1577	-1.0500	0.2960		
R-squared value = 0.7633						
P-value = 0.0000***						

Note: *, **, *** denote significance levels of 10%, 5%, and 1%, respectively. Source: Compiled by the author

Table 5 demonstrates that all independent variables (F1, F2, F3, F4, F5, and F5) exert a positive impact on GSQ, each with clear statistical significance.

The regression results show that all five independent factors significantly improve GSQ. Interaction Quality (IQ), Physical Environment Quality (PEQ), Effectiveness Quality (EQ), Access Quality (AQ), and Perceived Value (PV) all have positive coefficients. Among them, PV ($\beta = 0.3246$) and EQ ($\beta = 0.2893$) contribute the most, while AQ has a smaller but still meaningful effect ($\beta = 0.0675$). The model explains 76.33% of the variation in GSQ ($R^2 = 0.7633$), and the overall model is statistically significant ($p < 0.001$).

4 CONCLUSIONS AND POLICY IMPLICATIONS

The paper investigates the factors influencing GSQ at Tan Son Nhat International Airport. Following scale assessment and Exploratory Factor Analysis, six factors—F1, F2, F3, F4, and F5—were identified. The multiple regression results confirm that all factors exert a positive effect on ground service quality. These findings reinforce the view that improving GSQ is not only essential for enhancing passenger satisfaction but also aligns with broader sustainable development objectives, particularly those related to safe,

inclusive, and efficient transport systems under SDG 9 and SDG 11 (Quoc *et al*., 2025a; Quoc *et al*., 2025b; Quoc & Quoc, 2025; Tuyet & Dinh, 2025; Van & Le Quoc, 2024; Van *et al*., 2025a; Van *et al*., 2025b).

Access Quality is identified as the most critical factor, contributing 30.40% to GSQ. Providing complete and accurate information helps passengers better prepare and fosters greater trust in the service. Despite issues such as delays without specific explanations and an inconvenient booking system, customers continue to value the comprehensive flight information and timely service offered by Tan Son Nhat International Airport. This indicates that enhancing access quality will significantly improve overall GSQ. Airlines should prioritize improving their information delivery systems to ensure transparency and timeliness in communicating the reasons for delays. Additionally, upgrading the booking system to increase passenger convenience is advised. Such improvements will not only elevate service quality but also enhance customer trust and satisfaction.

The layout of counters and areas within the airport, along with the announcement and guidance systems, as well as the temperature and air quality, are critical factors influencing GSQ. An efficiently organized arrangement of check-in counters, information desks, security, and waiting areas facilitates passenger access to services, reduces waiting times, and enhances overall satisfaction. Clear and comprehensible announcement systems provide timely information, reducing confusion and stress, while boosting confidence in the service. A comfortable temperature environment, coupled with modern ventilation and air conditioning systems, enhances the passenger experience and creates a better working environment for staff. To improve GSQ, it is crucial to maintain an efficient layout, refine the announcement systems, and ensure a comfortable temperature, particularly on hot days.

Employee attentiveness in resolving passenger issues is a crucial factor influencing GSQ at Tan Son Nhat International Airport. Staff should demonstrate a strong sense of responsibility, address situations promptly and effectively, while maintaining a friendly and supportive demeanor. Their understanding, accessibility, and active listening play a significant role in building passenger trust and satisfaction, thus enhancing overall service efficiency. Therefore, it is recommended that employees receive training in communication skills, problem-solving, and service attitude, and that the presence of

support staff be increased to further improve passenger experience and ensure the delivery of high-quality ground services.

The most significant factor affecting GSQ at the airport is the alignment of service costs. Transparent and reasonable pricing boosts passenger satisfaction and confidence, creating a favorable impression of GSQ. The competitive nature of services at Tan Son Nhat International Airport compared to other airports is also vital, as high-quality service encourages repeat business. Additionally, the perceived value relative to cost greatly impacts satisfaction. Some passengers have observed that ticket prices and airport services have risen without a corresponding increase in quality. Adjust service pricing to better reflect the perceived value, while ensuring competitiveness and continuous improvement to enhance passenger satisfaction.

The most important factor influencing GSQ at the airport is the cleanliness of the check-in area. Cleanliness not only ensures passenger comfort but also reflects the airport's professionalism and attention to detail. Additionally, the modern design of the infrastructure at Tan Son Nhat International Airport is vital as it improves both the aesthetics and functionality of the space. Effective noise control is essential for maintaining passenger comfort, given that noise levels significantly impact the overall experience. Comfortable seating is also crucial, as it helps passengers feel at ease while waiting. Finally, orderly and respectful queue management is necessary to reduce stress and foster a professional service environment. To enhance GSQ, maintain high cleanliness standards in the check-in area, improve infrastructure design, manage noise effectively, repair any damaged seating, and organize queuing more efficiently.

The most crucial factor affecting GSQ at the airport is the convenience of the service system. Well-organized and easily accessible services lead to a more positive passenger experience. Additionally, providing essential information helps passengers feel secure and confident. Adhering to service commitments builds trust and credibility for the airport. Finally, offering useful information assists passengers in making decisions and reduces stress. Recommendation: Enhance the convenience of the service system, ensure the accuracy and completeness of information, fulfill service commitments, and provide useful information to improve GSQ at the airport.

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APPENDIX

Appendix 1

Summary Table of Measurement Scales Used in the Study

Factor	Component	Observed Variable Symbol	Source
Interaction Quality	The attitude of the staff shows me that they are ready to assist me.	IQ1	**Wu & Cheng (2013)**
	I can ask the staff for help whenever I need it.	IQ2	
	The staff are always willing to listen to my issues.	IQ3	
	The behavior of the staff gives me confidence in their service.	IQ4	
	The staff can handle my issues immediately.	IQ5	
	I can trust the staff when I need support.	IQ6	
	When I encounter a problem, the staff are concerned with resolving it.	IQ7	
	The staff understand the issues within their responsibility.	IQ8	
Physical Environment Quality (PEQ)	The areas at Tan Son Nhat International Airport are always clean.	PEQ1	**Wu & Cheng (2013)**
	The noise level at Tan Son Nhat International Airport is acceptable.	PEQ2	
	Queue management at Tan Son Nhat International Airport is very orderly.	PEQ3	
	The facilities at Tan Son Nhat International Airport have a modern design.	PEQ4	
	Seating at Tan Son Nhat International Airport is comfortable.	PEQ5	
	The walkways at Tan Son Nhat International Airport are easy to navigate.	PEQ6	
	The layout of supporting service areas (restaurants, shops, etc.) at Tan Son Nhat International Airport is well-organized.	PEQ7	
	The arrangement of check-in counters at Tan Son Nhat International Airport is very convenient.	PEQ8	
	The announcement and guidance systems at Tan Son Nhat International Airport are easy to understand.	PEQ9	
	The temperature at Tan Son Nhat International Airport always feels comfortable.	PEQ10	
	Customers receive services as promised.	EQ1	

Effectiveness Quality (EQ)	The information provided at Tan Son Nhat International Airport is useful.	EQ2	**Wu & Cheng (2013)**
	Tan Son Nhat International Airport understands the information customers need.	EQ3	
	The service system at Tan Son Nhat International Airport is convenient.	EQ4	
Access Quality (AQ)	Flight information is provided comprehensively.	AQ1	**Wu & Cheng (2013)**
	Flight information is provided accurately.	AQ2	
	The booking system is convenient.	AQ3	
	The process is facilitated for customers to complete procedures quickly.	AQ4	
	The information inquiry system at Tan Son Nhat International Airport is efficient.	AQ5	
	Passenger service requests are always met in a timely manner.	AQ6	
Perceived Value	The value I receive is commensurate with the cost I have paid.	PV1	**Qin & Prybutok (2009)**
	Tan Son Nhat International Airport offers more competitive services compared to other airports I have used.	PV2	
	The cost of ground services at Tan Son Nhat International Airport is reasonable.	PV3	
Ground Service Quality (GSQ)	Overall, the ground service quality (GSQ) at Tan Son Nhat International Airport is relatively good compared to my expectations.	GSQ1	**Wu & Cheng (2013)**
	The GSQ at Tan Son Nhat International Airport meets my needs.	GSQ2	
	The GSQ at Tan Son Nhat International Airport exceeds my expectations.	GSQ3	
	I would speak positively about the GSQ at Tan Son Nhat International Airport to others.	GSQ4	

Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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