EXTENDING THE SERVPERF FRAMEWORK TO AI-ENABLED AIRLINE SERVICES: THE ROLE OF DIGITAL TANGIBILITY IN PASSENGER SATISFACTION

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ABSTRACT
This study aims to investigate how passenger evaluations of AI-enabled airline services impact their overall satisfaction, utilizing an adapted SERVPERF framework in the AI context. The study focuses on Thai adults who have used at least one AI-enabled service in Thailand within the past 12 months, resulting in a final sample of 326 respondents. Multiple regression analysis was conducted to assess six service quality dimensions: Tangibles, Reliability, Responsiveness, Assurance, Empathy, and Security. The findings revealed that the six dimensions jointly explain 53.9% of the variance in customer satisfaction ($R^2 = 0.539$), and the overall model was statistically significant ($p < 0.001$). However, only Tangibles ($\beta = 0.628$, $p < 0.001$) was found to have a significant positive influence on satisfaction. The other five dimensions were not statistically significant. Theoretically, this study extends service quality literature by proposing the Re-conceptualization of Tangibles into Digital Tangibility (such as User Experience: UX, or User Interface: UI), identifying it as the primary satisfaction driver for digital-native users. Managerially, the findings guide airlines to prioritize investment in the Digital Tangibility and user interface of AI-enabled features, as the perceived visual and interactive quality most strongly drives passenger satisfaction.
Keywords: Artificial Intelligence, Airline Service Quality, SERVPERF, Digital Tangibility, Customer Satisfaction

INTRODUCTION

The airline industry is rapidly integrating AI technologies, such as chatbots and personalized systems, to enhance efficiency and passenger experiences (Geske et al., 2024). Although AI improves satisfaction, research limitations persist regarding its direct effects (Shiwakoti et al., 2022; Li, 2024; Kan et al., 2024). Prior studies prioritize technology acceptance over specific service quality dimensions, leaving uncertainty about drivers like Reliability or Security. In the Thai context, validated models like SERVPERF remain underutilized. Therefore, this study adapts the SERVPERF model—comprising Tangibles, Reliability, Responsiveness, Assurance, Empathy, and Security—to identify the most influential factors affecting customer satisfaction with AI-enabled airline services in Thailand.

LITERATURE REVIEWS

Artificial Intelligence in Airlines

The airline industry has rapidly transformed through AI technologies like chatbots and smart check-in systems. Defined as systems performing human-intelligence tasks, AI enhances efficiency and passenger experience via personalization and reduced wait times. Despite widespread implementation, few empirical studies examine AI service quality's impact on satisfaction, addressing a critical research gap.

AI-Enabled Services: Chatbots and Personalization

Li (2024) notes that chatbots and virtual assistants provide automated, 24/7 support, increasing convenience and responsiveness. Research confirms passengers perceive these tools as reliable, enhancing satisfaction and reflecting SERVPERF's Responsiveness and Reliability dimensions. Furthermore, recommendation systems analyze data to offer tailored suggestions, improving perceived quality and highlighting the importance of Empathy and personalization.

SERVPERF Framework and AI Service Quality

The SERVPERF model offers a stable, performance-based approach for evaluating AI services by focusing on actual delivery rather than expectation gaps. This study adapts the model by adding Security as a sixth dimension. In technology-mediated contexts, quality perception links to the Technology Acceptance Model (TAM), where Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) drive acceptance (Davis, 1989). Digital Tangibility directly influences PEOU, while Reliability and Responsiveness impact PU. Addressing the lack of physical elements, this study draws from E-SERVQUAL (Parasuraman et al., 2005) to redefine Tangibles as Digital Tangibility, encompassing UI/UX as the "Digital Physical Evidence" used to infer technological competence.

The Six Dimensions of AI-Enabled Service Quality

The six dimensions of AI-enabled service quality are defined as follows: Tangibles (Digital Tangibility) refers to UI/UX quality and visual design; Reliability ensures accuracy and dependability; Responsiveness involves speed and timeliness; Assurance reflects confidence in competence; Empathy denotes personalized interactions; and Security signifies confidence in data privacy and protection.

Passenger Satisfaction and Behavioral Intentions

Passenger satisfaction reflects the overall travel experience and mediates the relationship between service quality and behavioral outcomes (Li, 2024; Shiwakoti et al., 2022). Driven by both the functional efficiency and emotional reassurance of secure AI interactions, higher satisfaction leads to repurchase intention and positive word-of-mouth (Kan et al., 2024). Consequently, perceived AI quality increasingly influences airline choice, where innovative technologies enhancing trust and convenience are key to attracting and retaining passengers (Geske et al., 2024).
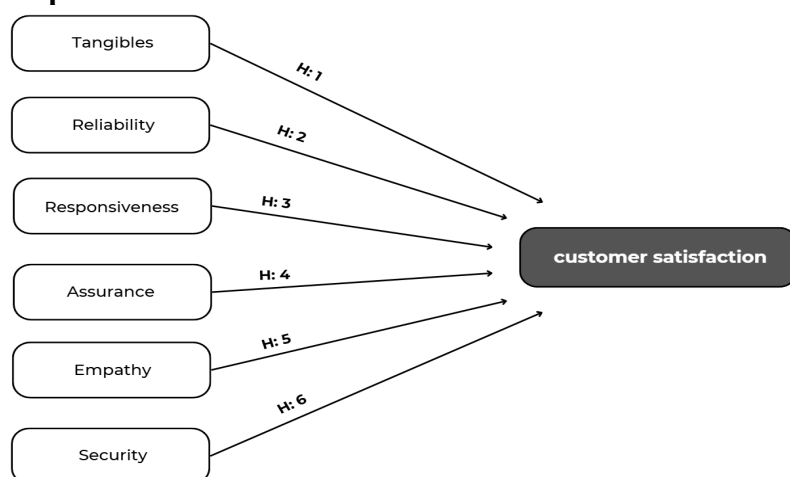
Future Research and Research Gaps

Despite AI's wide adoption in airlines, existing research remains largely descriptive, emphasizing usability over validated frameworks like SERVPERF (Kan et al., 2024; Shiwakoti et al., 2022). Consequently, the specific service quality dimensions driving satisfaction—particularly regarding chatbots and personalization—remain underexplored. Furthermore, the Security dimension regarding data privacy is often overlooked, and empirical studies within the Thai domestic context are scarce. This study addresses these gaps by 1) adapting SERVPERF for AI-enabled services, 2) empirically testing the influence of six dimensions, including Security, and 3) clarifying their impact on passenger satisfaction

Research Objectives and Hypotheses

The main objective is to examine the effect of AI service quality on passenger satisfaction. Specifically, the study aims to 1) assess the direct effects of Tangibles, Reliability, Responsiveness, Assurance, Empathy, and Security, and 2) identify the strongest influencer among Thai passengers. Therefore, it is hypothesized that Tangibles (H1), Reliability (H2), Responsiveness (H3), Assurance (H4), Empathy (H5), and Security (H6) each have a significant positive effect on satisfaction, while all dimensions collectively exert a significant impact (H7).

Conceptual Framework

Picture 1 Conceptual Framework

RESEARCH METHODOLOGY

Research Design

This quantitative study employs a structured survey to assess the impact of AI-enabled services, specifically chatbots and personalization systems, on customer satisfaction. Guided by an adapted SERVPERF framework, it evaluates six dimensions: Tangibles, Reliability, Responsiveness, Assurance, Empathy, and Security. SERVPERF was selected for its performance-only approach, avoiding expectation-based measures which are unreliable in emerging AI contexts. To minimize central-tendency bias, a six-point Likert scale (1 = Strongly Disagree, 6 = Strongly Agree) was utilized to eliminate the neutral midpoint, an approach supported by Yamashita (2022).

Population and Sample

The population consisted of adults (18+) who utilized AI-enabled airline services in Thailand within the past 12 months, excluding non-users and employees. Following Hair et al. (2019), the sample size exceeded the theoretical minimum of 120, aiming for higher statistical power with 326 valid responses collected. Recruitment via online travel communities intentionally targeted digital natives (Generation Z) as the heaviest AI users.

Variables and Measurement

This study employed seven composite variables derived from SERVPERF and an additional Security dimension, measured via averaged Likert-scale items. The six independent variables include: 1) Tangibles (AVG_TANG), averaging four items on interface design and functionality; 2) Reliability (AVG_RELI), averaging three items on consistency; 3) Responsiveness (AVG_RESP), averaging three items on speed and helpfulness; 4) Assurance (AVG_ASSU), averaging three items on credibility; 5) Empathy (AVG_EMPA), averaging three items on personalization; and 6) Security (AVG_SECU), averaging two items on data privacy. The dependent variable, Overall Passenger Satisfaction (AVG_SATISFACTION), was calculated as the mean of two items on a 6-point Likert scale (1 = Very Dissatisfied, 6 = Very Satisfied).

Data Analysis

Data analysis proceeded in three stages: 1) Descriptive Statistics to summarize demographics; 2) Cronbach's Alpha and Exploratory Factor Analysis (EFA) to ensure internal consistency and validity; and 3) Multiple Regression Analysis to test hypotheses H1-H6 regarding the six SERVPERF-AI dimensions' effects on Customer Satisfaction.

Ethical Considerations

Ethical protocols were strictly observed, ensuring informed consent, voluntary participation, and anonymity. This approach aligns with Kang and Hwang (2023) to foster trust and data quality. Furthermore, the study adhered to AAPOR (2022) professional standards for transparency and responsible data handling.

RESULTS AND DATA ANALYSIS

Table 1 Demographic Profile of Respondents

Variable	Category	Frequency	Percentage (%)
Nationality	Thai	267	81.9
	Non-Thai	59	18.1
Gender	Male	79	24.2
	Female	247	75.8
Monthly Income (THB)	< 10,000	211	64.7
	10,001-20,000	76	23.3
	20,001-30,000	25	7.7
	30,001-40,000	8	2.5
	40,001-50,000	2	0.6
	> 50,000	4	1.2
Generation	Baby Boomer	1	0.3
	Gen X	2	0.6
	Gen Y	11	3.4
	Gen Z	310	95.1
	Gen Alpha	2	0.6

Table 1 details 326 respondents, predominantly female (75.8%), Thai (81.9%), students (87.4%), and Generation Z (95.1%) earning under 10,000 THB (64.7%). This intentional skew toward young, digitally fluent Gen Z users provides an ideal target group for capturing core perspectives on AI-enabled airline services.

Table 2 Reliability Analysis (Cronbach's Alpha)

Dimension	Number of Items	Cronbach's Alpha
Tangibles	4	0.894
Reliability	3	0.863
Responsiveness	3	0.868
Assurance	3	0.873
Empathy	3	0.886

As shown in Table 2, reliability was established with Cronbach's Alpha scores exceeding 0.70, led by Security ($\alpha = 0.905$) and Tangibles ($\alpha = 0.894$). Validity was confirmed via Exploratory Factor Analysis (PCA with Varimax rotation), showing a KMO of 0.901 and a significant Bartlett's Test ($\chi^2 = 3{,}241.25$, $p < 0.001$). The analysis explained 67.13% of the total variance with factor loadings above 0.618, ensuring all 18 items loaded correctly on their respective constructs.

Descriptive Statistics and Regression Analysis

Table 3 Descriptive Statistics

Variable	Mean	Std. Deviation	N
Tangibles	4.653	0.934	326
Reliability	4.589	0.937	326
Responsiveness	4.666	0.958	326
Assurance	4.465	1.007	326
Empathy	4.668	0.967	326
Security	4.575	1.031	326
Customer Satisfaction	4.603	0.994	326

As shown in Table 3, descriptive statistics indicate high performance across all dimensions, with mean values exceeding 4.4 on a 6-point scale. Notably, Responsiveness (M = 4.666) and Empathy (M = 4.668) received the highest ratings.

Table 4 Model Summary

Model	R	R²	Adjusted R²	Std. Error	Durbin-Watson
1	0.734	0.539	0.531	0.681	0.902

Table 4 indicates a strong relationship, with the regression model explaining 53.9% of customer satisfaction variance ($R^2 = 0.539$). Although the Durbin-Watson statistic of 0.902 suggests positive autocorrelation, the model remains robust given the homogeneous, cross-sectional Gen Z sample. Furthermore, low Variance Inflation Factor (VIF) values confirm no multicollinearity, validating the model's ability to identify key satisfaction drivers.

Table 5 ANOVA

Source	Sum of Squares	df	Mean Square	F	Sig.
Regression	172.988	6	28.831	62.219	0.000
Residual	147.820	319	0.463		
Total	320.808	325			

As shown in Table 5, the overall regression model is statistically significant ($F_{(6, 319)} = 62.219$, $p < 0.001$), confirming that the six AI service quality dimensions jointly influence passenger satisfaction.

Table 6 Coefficients of Independent Variables

Independent Variable	Unstandardized β	Std. Error	Standardized β	t	Sig.	VIF
(Constant)	0.789	0.216	-	3.649	0.000	-
Tangibles	**0.668**	**0.066**	**0.628**	**10.157**	**0.000**	**2.646**
Reliability	0.103	0.078	0.097	1.320	0.188	3.754
Responsiveness	-0.025	0.070	-0.024	-0.354	0.724	3.140
Assurance	0.027	0.065	0.028	0.419	0.675	3.022
Empathy	-0.032	0.068	-0.031	-0.471	0.638	3.037
Security	0.082	0.058	0.085	1.406	0.161	2.550

As shown in Table 6, only Tangibles (β = 0.628, p < 0.001$) significantly predicts satisfaction, while Reliability, Responsiveness, Assurance, Empathy, and Security proved non-significant (p > 0.05). This result reflects the 95.1% Gen Z sample, for whom functional attributes are baseline "hygiene factors," whereas Digital Tangibility (UI/UX) serves as the primary quality differentiator. A multicollinearity check confirmed this behavioral interpretation, with VIF values (2.550-3.754) remaining well below the threshold of 5.

CONCLUSION & DISCUSSION
Conclusion

This study confirms that the adapted SERVPERF model explains a significant portion of passenger satisfaction in Thailand (R^2 = 53.9%). However, Digital Tangibility emerged as the overwhelming primary driver. For the young, digital-native passenger base, the visual and interactive quality of the AI interface serves as the critical determinant of satisfaction.

Discussion of Findings

Table 7 Summary of Hypothesis Testing

Hypothesis No.	Independent Variable	Standardized Coefficient (β)	Sig. (p-value)	VIF	Result
H1	Tangibles	0.628	0.000	2.646	**Supported**
H2	Reliability	0.097	0.188	3.754	Not Supported
H3	Responsiveness	-0.024	0.724	3.140	Not Supported
H4	Assurance	0.028	0.675	3.022	Not Supported
H5	Empathy	-0.031	0.638	3.037	Not Supported
H6	Security	0.085	0.161	2.550	Not Supported
H7	Collective Effect (Overall Model)	—	0.000	—	**Supported**

As shown in Table 7, the overall model (H7) was supported (p < 0.001), confirming that the six dimensions collectively influence satisfaction. However, the strong support for H1 (β = 0.628) identifies Digital Tangibility as the primary driver, serving as "digital physical evidence" for the 95.1% Gen Z sample. The non-significance of H2-H6 is explained by the demographic profile: for this digital-native, student-predominant cohort, functional attributes like Reliability and Security are perceived as basic "hygiene factors" expected by default rather than satisfaction drivers. Consequently, visual interaction quality serves as the key differentiator. This contrasts with Li (2024), who found Empathy significant in Western contexts; Thai consumers, however, appear to prioritize visual clarity and stability over emotional interaction.

Managerial Implications

The results provide clear guidance for airlines. First, investment must prioritize UI and UX design, as visually dynamic experiences are the primary satisfaction driver for next-generation travelers. Second, Reliability and Security must be treated as "cost of entry" hygiene factors; while they do not drive satisfaction, maintaining them is non-negotiable to preserve trust, leaving Tangibles as the key differentiator. Finally, airlines should adopt a fail-safe design to ensure AI systems are both visually pleasing and functionally trustworthy across the customer journey.

Theoretical Contributions

This study offers two primary theoretical contributions. First, it redefines Tangibles as Digital Tangibility, empirically validating that digital interaction now serves as the primary conduit for inferring service quality in technology-mediated environments. Second, it proposes the SERVPERF Digital Framework, integrating Digital Tangibility and Security to align the traditional model with AI-driven realities, providing a validated tool for future research.

Limitations and Recommendations for Future Research

The primary limitation is the sample's skew toward Generation Z students (95.1%), potentially limiting generalizability to other demographics who may prioritize Reliability or Assurance. Future research should utilize Structural Equation Modeling (SEM) to test the SERVPERF-Digital framework and mediating variables, complemented by qualitative interviews to explore why digital natives view functional attributes as hygiene factors. Ultimately, the study confirms that Digital Tangibility overwhelmingly dictates satisfaction with AI-enabled airline services, providing vital theoretical and managerial guidance.

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