Passenger Behavior and Touchpoint Bottlenecks in Self-Service Technologies at Phuket International Airport

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Abstract

This study aimed to investigate passenger behavior toward self-service technologies (SSTs), identify operational touchpoint bottlenecks, and propose practical improvement guidelines at Phuket International Airport. A quantitative survey method was employed using questionnaires distributed to 400 passengers who had used airport technologies within the previous 12 months. Data were collected during peak travel periods across weekdays and weekends using convenience sampling. Descriptive statistics, including frequencies and percentages, were applied for data analysis.

The findings revealed that self-check-in kiosks were the most frequently used SSTs (65.00%), followed by airport or airline mobile applications (32.25%). Boarding gates were identified as the primary bottleneck area where passengers experienced the longest waiting times (29.25%), followed by check-in points (23.50%) and baggage claim areas (19.25%). The major factors influencing technology usage were convenience and speed (65.50%) and queue reduction (36.25%). Although most passengers learned to use the technologies independently (61.75%), many still relied on guidance from ground staff (51.50%).

The study highlights that while self-service technologies improve operational efficiency and passenger convenience, human support remains essential for effective service delivery. The findings suggest that airports should adopt a hybrid service model integrating digital technologies with proactive staff assistance, particularly at critical passenger touchpoints.

Keywords: Passenger Behavior, Self-Service Technology, Operational Bottlenecks, Hybrid Service Model, Phuket International Airport

Introduction

The rapid digital transformation in the aviation industry has accelerated the adoption of self-service technologies (SSTs) to improve operational efficiency and enhance passenger experience. Airports worldwide increasingly utilize technologies such as self-check-in kiosks, mobile applications, biometric systems, and automated boarding gates to manage growing passenger volumes and reduce service congestion (Airports Council International [ACI], 2021).

As one of Thailand's major tourism gateways, Phuket International Airport experiences high passenger density, particularly during peak travel seasons. The increasing number of travelers often creates operational challenges, including long waiting times, terminal congestion, and service delays (Wattanacharoensil et al., 2021). To address these issues, airports have increasingly integrated SSTs into passenger service processes to improve convenience, speed, and service flow management.

Previous studies have mainly focused on technology acceptance and behavioral intention toward SST adoption (Bogicevic et al., 2017; Taufik & Hanafiah, 2019). However, limited research has examined actual passenger service behavior, operational bottlenecks, and touchpoint-level experiences within airport environments, particularly in regional tourism airports. Understanding passenger interaction patterns and waiting-time pain points is important for improving airport operations and enhancing the overall passenger journey.

Therefore, this study investigates passenger behavior toward SSTs at Phuket International Airport using the 6W1H framework. The study also identifies major operational bottlenecks and proposes practical guidelines for improving airport service management and digital passenger experiences.

To summarize the operational flow of passenger interactions with self-service technologies (SSTs) and the major congestion points identified in this study, the conceptual framework of passenger behavior and operational bottlenecks at Phuket International Airport is presented in Figure 1.

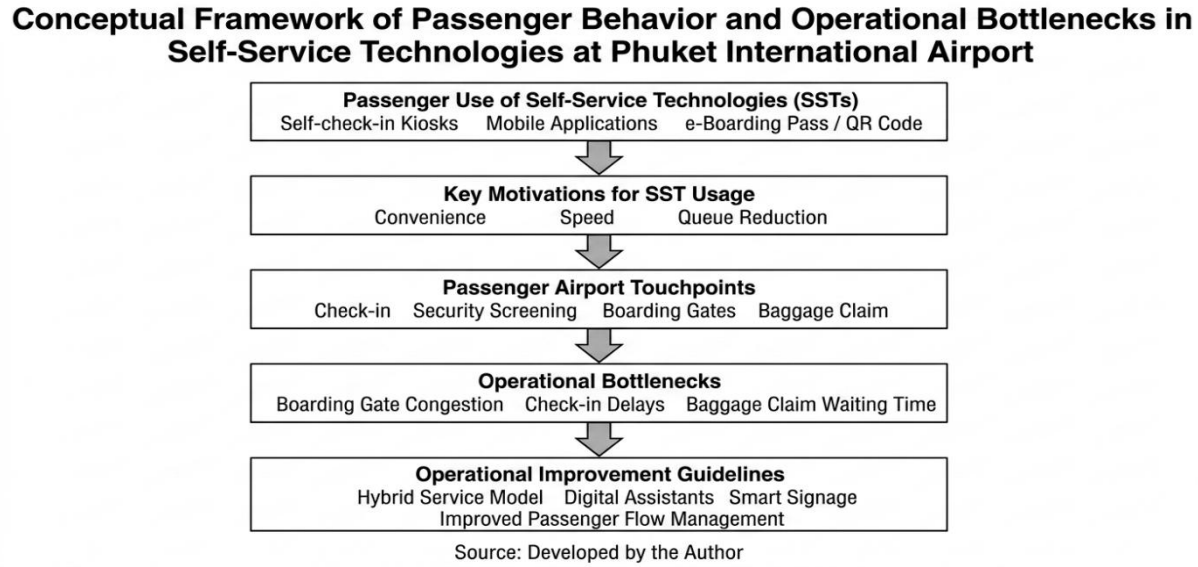

Figure 1 Conceptual Framework of Passenger Behavior and Operational Bottlenecks in Self-Service Technologies at Phuket International Airport

Research Objective

1. To investigate passenger behavior toward self-service technologies at Phuket International Airport.
2. To identify operational touchpoint bottlenecks and waiting-time problems within the passenger terminal.
3. To propose practical guidelines for improving airport service operations and digital passenger experience.

Research Methodology

This study employed a quantitative survey research design to investigate passenger behavior toward self-service technologies (SSTs) at Phuket International Airport. The target population consisted of passengers who had used at least one type of airport self-service technology within the previous 12 months.

Since the exact population size was unknown, the sample size was determined using Cochran's (1977) formula for an unknown population at a 95% confidence level. The minimum required sample size was approximately 385 respondents; therefore, the sample size was increased to 400 participants to ensure data completeness and reliability.

Convenience sampling was conducted at major passenger terminal areas during peak travel periods. To improve data representation and reduce temporal bias, data collection was distributed across weekdays, weekends, and different time periods, including morning, afternoon, and evening operations.

The research instrument was a structured questionnaire consisting of two sections: (1) demographic and travel information and (2) passenger behavior toward SSTs based on the 6W1H framework. In addition, open-ended questions were included to collect passenger suggestions and operational improvement recommendations.

The questionnaire items were developed based on the 6W1H framework and covered seven dimensions: Who (travel companions), When (travel period), Which (type of airline used), What (self-service technologies utilized), Where (touchpoints with the longest waiting time), Why (reasons for technology usage), and How (technology learning behavior). These dimensions were designed to capture passenger interaction patterns with airport self-service technologies and to identify operational bottlenecks throughout the passenger journey.

The questionnaire was examined for content validity by three experts in aviation and service management. A pilot test with 30 respondents demonstrated acceptable reliability, with the Cronbach's alpha coefficient exceeding 0.80.

Data were analyzed using descriptive statistics, including frequencies and percentages, through statistical software.

Research Results

The analysis of passenger travel characteristics revealed that most respondents traveled with friends or family (52.25%), followed by those traveling alone (29.25%) and tour groups (17.25%). Regarding travel periods, the morning period represented the highest passenger traffic (48.00%), followed by night (20.00%), afternoon (17.00%), and evening operations (15.00%). In terms of airline usage, low-cost carriers accounted for the largest proportion of passengers (52.00%), followed by full-service airlines (39.50%). Table 1 presents the passenger travel characteristics based on the 6W1H framework.

Table 1 Passenger Travel Characteristics (n = 400)

Travel Behavior Topics (6W1H)	Frequency (n)	Percentage (%)
1. Who – Whom do you travel with?		
- Friends / Family	209	52.25
- Alone	117	29.25
- Tour Group	69	17.25
- Others	5	1.25
2. When – Most frequent travel time period		
- Morning	192	48.00
- Night	80	20.00
- Afternoon	68	17.00
- Evening	60	15.00
3. Which – Type of airline latest utilized		
- Low-cost Airlines	208	52.00
- Full-service Airlines	158	39.50
- Unsure	34	8.50

The findings regarding self-service technology (SST) usage indicated that self-check-in kiosks were the most frequently utilized technologies among passengers (65.00%), followed by airport or airline mobile applications (32.25%) and e-boarding passes or QR codes (22.75%).

Regarding operational touchpoints, boarding gates were identified as the area where passengers experienced the longest waiting times (29.25%), followed by check-in points (23.50%) and baggage claim areas (19.25%). In contrast, immigration control and security screening checkpoints generated comparatively lower levels of congestion.

The main factors influencing SST usage were convenience and speed (65.50%) and queue reduction (36.25%). In terms of technology learning behavior, most passengers reported learning independently through self-exploration (61.75%). However, a considerable proportion of passengers still depended on direct guidance from ground staff (51.50%). Table 2 summarizes passenger behavior toward self-service technologies at the airport.

Table 2 Passenger Behavior Toward Self-Service Technologies (n = 400)

Technology Behavior Topics (6W1H)	Frequency (n)	Percentage (%)
4. What – Actual technology utilized in the airport*		
- Self-check-in kiosks	260	65.00
- Airport / Airline applications	129	32.25
- e-Boarding pass / QR Code	91	22.75
- Others (e.g., Self bag-drop, Biometric systems)	62	15.50
5. Where – Touchpoint where you spend the longest waiting time		
- Boarding Gates	117	29.25
- Check-in Points	94	23.50
- Baggage Claim Areas	77	19.25
- Security Screening Checkpoints	47	11.75
- Immigration Control / TM	30	7.50
- No specific touchpoint is particularly long	35	8.75
6. Why – Core reason for choosing to use technology*		
- Convenience and speed	262	65.50
- Queue reduction	145	36.25
- Familiarity / Used it before	98	24.50
- Ground staff recommendation	94	23.50
- Reducing physical contact	46	11.50
7. How – How you learned to use the technology*		
- Self-exploration / Self-study	247	61.75
- Ground staff recommendation / Guidance	206	51.50
- On-site signage / Manuals	93	23.25
- Friends or family recommendation	74	18.50

***Note:** Multiple-choice items permitted respondents to select more than one answer; therefore, aggregate percentages exceed 100%

Research Discussions

The findings indicate that self-service technologies (SSTs) play an important role in improving passenger processing efficiency and service convenience at Phuket International Airport. The high utilization rate of self-check-in kiosks reflects the growing acceptance of digital technologies among air travelers. This result is consistent with previous studies suggesting that passengers prefer technologies that reduce waiting time and improve service speed (Bogicevic et al., 2017).

The study also found that convenience, speed, and queue reduction were the primary factors influencing SST usage. These findings support the work of Ku and Chen (2013), who reported that passengers

are more likely to adopt self-service technologies when the systems improve operational convenience and provide greater control over the travel process.

Although SST adoption was relatively high, operational congestion remained evident at several passenger touchpoints, particularly boarding gates, check-in points, and baggage claim areas. This finding suggests that improvements in digital service systems alone may not fully resolve passenger flow problems if physical operational capacity remains limited. The result is consistent with Wattanacharoensil et al. (2021), who emphasized that airport passenger experience depends on the integration of both technological efficiency and physical service infrastructure.

Such bottlenecks may negatively affect passenger perceptions of service quality, increase travel-related stress, and reduce overall satisfaction with the airport experience. As passengers increasingly expect seamless and efficient airport services, unresolved congestion at critical touchpoints may diminish the benefits of self-service technologies and limit the effectiveness of airport operations.

In addition, the findings revealed that many passengers continued to rely on guidance from ground staff despite the availability of self-service systems. This reflects the continuing importance of human support in digital airport environments, especially for elderly passengers, first-time users, and travelers with limited digital experience. The result supports the study by Moon et al. (2021), which highlighted that human assistance remains an important factor in maintaining passenger confidence and service quality within non-contact airport operations.

The proposed hybrid service model is conceptually grounded in the complementary roles of technology and human support within airport service systems. While self-service technologies improve processing efficiency and reduce operational workload, human assistance remains essential for addressing user uncertainty, facilitating service accessibility, and supporting passengers who encounter difficulties during the travel process. This proposition is further supported by the finding that more than half of the respondents continued to rely on guidance from ground staff despite the availability of self-service technologies.

Overall, the study demonstrates that effective airport digital transformation should combine technological innovation with appropriate operational support. Integrating SSTs with proactive staff assistance may help improve passenger flow efficiency and enhance the overall airport service experience.

Summary of Research Results

This study investigated passenger behavior toward self-service technologies (SSTs), identified operational touchpoint bottlenecks, and proposed practical improvement guidelines at Phuket International Airport. The findings revealed that self-check-in kiosks were the most frequently used technologies among passengers, while convenience, speed, and queue reduction were the major factors influencing technology adoption.

The study also identified boarding gates, check-in points, and baggage claim areas as the primary operational bottlenecks where passengers experienced the longest waiting times. Although many passengers were able to use SSTs independently, a considerable proportion still relied on assistance from ground staff during the service process.

Overall, the findings indicate that self-service technologies can improve operational efficiency and passenger convenience; however, effective airport service management still requires adequate human support and coordinated operational capacity at critical passenger touchpoints. The study highlights the importance of integrating digital technologies with proactive service assistance to enhance passenger experience and reduce congestion within airport operations.

Limitation of the Study

This study focused primarily on passenger behavior and operational touchpoint bottlenecks related to self-service technologies (SSTs) at Phuket International Airport. The analysis was limited to descriptive statistical techniques and did not examine causal relationships among technology acceptance factors, behavioral intention, and passenger experience based on the UTAUT2 framework. In addition, the study employed convenience sampling and was conducted primarily during the peak tourism season; therefore, the findings may not fully represent passenger behavior across different passenger groups, tourism seasons, or airport contexts. Passenger behavior and perceived congestion levels may vary under different operational conditions, and the findings may not fully reflect airport operations during off-peak periods, where passenger volume and service demand are likely to differ.

Recommendations

Based on the findings of this study, several practical recommendations are proposed to improve self-service technology (SST) operations and passenger experience at Phuket International Airport.

1. Airport operators should adopt a hybrid service model by integrating self-service technologies with proactive staff assistance. Ground staff or digital assistants should be available at key SST areas to support elderly passengers, first-time users, and travelers experiencing difficulties with the systems.

2. Operational capacity at major passenger bottlenecks, particularly boarding gates, check-in points, and baggage claim areas, should be improved to reduce congestion and waiting times during peak travel

periods. Airport management may consider expanding automated processing systems and improving passenger flow management at these touchpoints.

3. Multilingual digital signage and user-friendly instructions should be installed near SST areas to support independent technology usage among international passengers. Clear visual guidance may help reduce confusion and improve service efficiency.

4. Future studies should examine passenger behavior in different airport contexts and seasons to provide broader operational insights and comparative analysis regarding self-service technology adoption and airport service management.

5. Future studies may employ inferential statistical techniques, such as chi-square analysis, regression analysis, or structural equation modeling (SEM), to investigate relationships among passenger characteristics, self-service technology usage, operational bottlenecks, and passenger experience.

6. Future research should consider applying probability sampling techniques to improve the representativeness and generalizability of the findings across different passenger groups and airport contexts.

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