EXPLORING THAI AIRPORTS USERS' EXPECTATIONS AND PERCEPTIONS BASED ON SERVICE QUALITY INDICATORS USING CLASSIFICATION AND REGRESSION TREE APPROACHES

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AUTHOR CONTRIBUTION

Conceptualization, T.C. and N.C methodology, T.C.; software, V.R.; validation, S.J. and D.C.; formal analysis, T.C.; investigation, T.P.; data curation, D.C.; writing—original draft preparation, T.C. and N.C; writing—review and editing, N.C. and N.L.; visualization, T.P.; supervision, V.R. and S.J; project administration, S.J.; funding acquisition, S.J

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ABSTRACT

Objective: The primary objective of this research is to develop a model that can identify the significance of variables impacting the expectations and perceptions of service users at Thai airports. This investigation specifically focuses on the indicators of service quality. *Methodology:* The Classification and Regression Trees (CART) method. Two distinct models were constructed: (1) a model analyzing airport user expectations, and (2) a model assessing the perceived service quality by airport users. The target variable for both models was airport passenger satisfaction. *Findings:* The analysis of the airport service user expectation model unveiled that the most crucial factor impacting customer satisfaction is the adequacy of parking spaces. Conversely, the perception model demonstrated that customer satisfaction is primarily influenced by the politeness and assistance provided by airport inspectors. *Conclusion:* The results derived from this study can provide valuable insights to airport regulators, aiding their comprehension of user requirements in terms of both expectations and perceptions. By understanding these needs, airport authorities can work towards satisfying them effectively. *Implications:* The findings of this research have several implications for airport authorities. They can utilize the guidelines and recommendations proposed in this study to enhance airport facilities and processes, ultimately improving passenger satisfaction.

1. INTRODUCTION

The global airport industry is currently experiencing rapid change. The increase in the number of airports and competition in the service sector creates more alternatives for service users. Airports are competing to stand out by providing the better services to meet their customers' needs (Bulut & Aydogan, 2020). Although airport service quality (ASQ) is merely one of the factors affecting service choice, it is a major factor that influences an airport's attractiveness and increases its competitive advantage in the airport industry (Pappachan, 2020). Thailand's airport industry is currently facing overcrowding problems in terminals, fluctuating user demand, diverse employees collaboration and an availability of various service providers, and different users' expectations and perceptions of service quality (Halpern & Mwesiumo, 2021). Despite the effort of minimizing service defects such as check-in, luggage delivery, security screening, passport control, etc., service failures are inevitable at the airport because of diverse cultures, which may impact user satisfaction. Such impacts may vary. An impact that appear insignificance may be more severe and affect the service users' intention to use the service in the long-run. The ASQ is, therefore, important for users. It must accommodate travelers from a variety of cultural backgrounds and nations. Therefore, it is difficult to predict users' needs. ACI (2021) reported that a customer satisfaction survey has been conducted through questions related to ASQ and assessed through user expectations and perceptions of the services provided by the airport. As ASQ is vital, it is necessary that airports adapt to keep up with the abrupt changes in economic, social, environmental, and technological conditions to create unique service quality that potentially leads to the user satisfaction.

In Thailand, tourism plays a significant role in contributing to the country's Gross Domestic Product (GDP), accounting for approximately 18% of the total revenue, excluding the year affected by the coronavirus 2019 pandemic (Statista, 2022). The airport, being the initial point of contact for both foreign and domestic tourists, holds great importance in shaping their first impressions (de Barros et al., 2007), Consequently, it is crucial to continually enhance the service quality provided by the airport. Assessing service quality often involves measuring both customer expectations and perceptions (Mainardes et al., 2021). Previous studies have demonstrated that analyzing service quality indicators can yield valuable insights for guiding strategic airport improvements (Pandey, 2020).

This research has analyzed the service quality expectations and perceptions of airport users particularly concerning whether they are relevant to their needs (Kurniawan et al., 2017) by examining ASQ indicators that affect user satisfaction, as customer satisfaction is essential for the ASQ improvement. The variables related to user expectations and perceptions of ASQ were studied and analyzed through the established models, from which the results can be used as a guideline for managing, strategic planning, developing, and improving service efficiency. Studies on ASQ expectations and perceptions (**Table 1**) have focused on analyzing the factors affecting

user expectations to determine and measure the ASQ. One study analyzed the factors related to consumer expectations and perceptions to examine airport service efficiency (Njoku & Udoka, 2021); however, the importance of variables affecting the user expectations and perceptions based on statistical models has not been compared or studied through service quality indicators.

Table 1. Comparison with other studies in analysis of users' expectations and perceptions.

Studies	Expectation	Perception	Comparison of two models	Raised issues
This Study	√	√	√	Case study Airport in Thailand; Compare the results of the two models.
Ford (2001)	√			Examined for interactions with service providers in public, and commercial service contexts.
Fodness and Murray (2007)	√			Development a conceptual model of service quality in airports by empirical investigation.
Park (2007)		√		Buying behavior
Farahani and Törmä (2010)	√			An empirical study, namely function, interaction, and diversion.
Park and Jung (2011)		√		Passengers' perceptions are different according to differences in cultural backgrounds.
Liou et al. (2011)		√		Impact on promoting or discouraging future tourism and business activities.
OJO (2014)		√		Recommendations for meeting the myriad shortfalls of Nigeria.
Chonsalasin et al. (2021)	√			Measuring airport quality
Bezerra et al. (2021)	√			Relationships with ASQ dimensions; identify the differences customer.
Njoku and Udoka (2021)	√	√	√	Performance of service quality in Murtala Muhammed International Airport, Lagos, Nigeria.

There have been no studies on the models; therefore, this study aims to investigate the importance of variables influencing the expectations and perceptions of airport passengers using the service quality indicator, which focuses primarily on the airport users' satisfaction to help improve the efficiency of the airport industry. It is crucial

that service providers must understand what service quality, service standards, and infrastructure serve customer needs. Knowledge of service quality, user satisfaction analysis, and the application of big data analysis is important. A model has been developed based on the relevant variables by using Classification and Regression Tree (CART) analysis to identify the significance of variables affecting airport service users' expectations and perceptions. The research results can be used for the improvement of airport service and its constant development to help meet the ever-changing needs of users.

2. LITERATURE REVIEW

In order to investigate the factors that are associated with airport service quality, which is the main objective of this study in developing a model of passenger expectations and perceptions that influence passenger satisfaction, a comprehensive literature review was conducted. The literature review consisted of four subsections. Firstly, an analysis of the Airport Service Quality (ASQ) indicators was performed to explore the key dimensions of airport service quality. Secondly and thirdly, the concept of passenger expectations and perceptions were examined to gain a deeper understanding of their relationship with passenger satisfaction. Finally, the classification and regression tree method was employed as the analytical technique to analyze the dataset.

2.1. ASQ

Most airports accommodate users with different cultures, languages, and ethnicities (Halpern & Graham, 2018). Thus, predicting an airport user's needs is not easy. For this reason, the ASQ was measured by direct user perceptions, which is the overall impression users' have about the airport. User perceptions are service quality indicators of the ASQ. Service quality indicators are derived by comparing user expectations with the airport services they receive, while the actual received or perceived services depend on the level of satisfaction the user receives from the airport. Adeniran and Fadare (2018) stated that the ASQ measurement potentially helps establish a positive view or attitude toward airports. However, the level of service user satisfaction is ambiguous because it is dependent on how effectively airport meets the consumer's expectations (Halpern & Mwesiumo, 2021). In other words, ASQ is a variable that is affected by two main factors: the service user expectation and the service user perception of the airport (Khantanapha, 2000).

The quality of airport service is a key indicator of success. Emphasizing the importance of service quality can help satisfy or even exceed the airport users' needs (Fodness & Murray, 2007). In addition, higher level of ASQ helps satisfy customers and promotes credibility, image, differentiation, and loyalty among new and former

airport users (Han et al., 2018). Therefore, several airports worldwide have developed strategies to improve the quality of their service in order to maximize efficiency and effectiveness. The measurement of ASQ has become an increasingly important issue as it exposes the users' attitudes toward airports. The Airports Council International (ACI) has surveyed factors affecting ASQ:

- Access: The convenience of getting to and from the airport for users, which includes airport transfers service, private cars, and public transport (Chonsalasin et al., 2021), as well as adequate parking spaces, affordable parking fees, and available luggage carts/trolleys (Champahom et al., 2022; Tseng et al., 2008).

- The waiting time for check-in and passport verification are both factors in check-in efficiency. Proficiency of check-in staff, etiquettes of check-in employees, and their attitudes (Bezerra & Gomes, 2016).

- The timing for passport/personal identification control and passport/ID card verification (Pappachan, 2020). The attainability of service and assistance from the inspector's.

- Security: An airport security system consists of the security personnel's attitude and manners , service and help provided by security staff, the trust of service users, rigorous security inspection , security screening process, safety and waiting time for security inspection (Bezerra & Gomes, 2016).

- Airport navigation: The uncomplicated navigation of airport routes and the simple identification of flight information board. Appropriate walking distances to terminals , practical flight transfers (Brueckner & Lin, 2016), and the availability of maps or guidance to assist with terminal navigation.

- The availability of airport facilities that serve the needs of passengers entering the airport, such as restaurants or places for eating food. (They should be places that are worth paying for) (Han et al., 2018). Banks/kiosks ATM/money changers are available, and shopping zones (they should be suitable enough for users to desire to spend their money). Internet/Wi-Fi availability and the accessibility of business lounges or executive lounges . Adequate and clean restrooms. The convenience of waiting areas or gates up and down is ready for use, besides the politeness and help of airport staff.

- Airport Environment: The modern terminal building, the comfort level of the surrounding atmosphere of the airport , and waiting area. Adequate parking and restrooms for passengers. The cleanliness of terminal buildings, car parks, and restrooms (Yang et al., 2015).

- Arrival services: The promptness of management involved in the handling of airport arrivals users, as well as immigration check-point, customs inspection, and baggage delivery service (Rendeiro Martín-Cejas, 2006).

2.2. Expectation

User expectations are commonly accepted as the basis for determining ASQ (Farahani & Törmä, 2010). Most airports acknowledge that user expectations are important in determining ASQ. The nature of those expectations is complex . Several studies on users' expectations of ASQ revealed their distinctiveness and suggestions have been made on how ASQ can be improved (Diaz-Martin et al., 2000). Understanding and managing user expectations potentially help diagnose problems and build long-term relationships with airport users (Yang, 2003). In terms of ASQ, user expectations, which play a substantial role, are based on prior airport access experiences and provide consumers' perspectives on what to expect from the airport. Lovelock et al. (2011) stated that consumer expectations of service quality varies depending on the situation and population group. They also believe that previous experiences with various services influence consumer expectations (Wong & Sohal, 2003). One can therefore conclude that user expectations are related to their expected or greater demands (Farahani & Törmä, 2010). User expectations are critical in measuring the airport service quality. If the outcomes of the service users' expectations are met or exceeded, they will repurchase that airport service (Halpern & Mwesiumo, 2021).

2.3. Perception

Service users' perceptions related to ASQ are essential for managing and improving the airport service quality. Aside from the more intensely competitive airport services , user perception of the service quality leads to positive word-of-mouth for airport services, resulting in a steady customer base and customer loyalty (Prentice & Kadan, 2019). User satisfaction is the overall outcome of perceptions, expectations, and experiences in using airport services. Perceived service quality is influenced by users' expectations (Bae & Chi, 2021). Service quality will be higher if the service quality meets or exceeds the expectations of various individual users based on the five senses: sight, hearing, taste, touch, and smell .

2.4. Classification and Regression Tree (CART)

The CART method is a concept established by Breiman et al. (1984) to describe the Decision Tree Analysis, or Classification Tree, which is the basis of Machine Learning and Data Analysis. Mining is used to solve the predictive modeling problem of classification. It shows the value of a target variable that can be predicted by using the value of an independent variable or another factor by repeatedly partitioning the predictors . The model can be expressed in a hierarchical form (Elmitiny et al., 2010). The analysis and interpretation of the CART method are simple to understand. It is

commonly used for travel needs analysis, user behavior , service user satisfaction , and other purposes. According to Sharma (2021), Machine Learning Analysis based on the CART is the process of building a model of continuous or discrete dependent variables by repeatedly dividing the data areas, optimizing, and equalizing the fundamental prediction model. Tsami et al. (2018) surveyed service user satisfaction of urban bus stations, such as transportation information, routing information, time and access to service, convenience in accessing the service, the station's attractiveness, safety, and security, dealing with situations or emergencies, and overall satisfaction of service users, etc., by using decision-making structures. The findings can be used to evaluate the performance and services provided by urban bus terminals. Sonawani and Mukhopadhya (2013) conducted a study on online service quality to differentiate similar functioning services by taking a decision-making structure to test and find the best decision-making method for accurate classification of web services with similar functionality or service.

3. MATERIALS AND METHODS

3.1. Data collection

The questionnaire consisted of two parts: 1) general information and travel behavior data of domestic airline passengers (e.g., gender, age, education level, income, occupation, frequency of service, experience in using the service, etc.); and 2) indicators of ASQ expectations and perceptions, comprising questions asking for opinions on the factors and indicators of service quality affecting the expectations and perceptions of airport users in Thailand.

Previous studies have indicated that a minimum sample size of 200 is required (Loehlin & Beaujean, 2017), or that the sample size should be at least 15 times the number of relevant variables . As there are 33 variables in the study, the minimum sample size is 495. Therefore, this study surveyed 1,037 airport passengers, which was considered a sufficient sample for statistical analysis.

The participants in this study were those who had utilized domestic airport services, had experience going through airports and using airport services, and were willing to participate in the survey. The data was collected using questionnaires and face-to-face interviews with 1,037 respondents in the airport terminals with no restrictions on gender or age range. The data was collected from airports in all four regions of Thailand, including the South, the North, the Central, and the Northeast, to acquire representative statistics on the Thai people nationally. The respondent characteristics were shown in **Table 2**.

Table 2. Demographic of respondents (N = 1,037).

Characteristics	Frequency	Percentage	Characteristics	Frequency	Percentage
Gender			Occupation		
Male	516	49.76%	Government official / State	358	34.52%
Female	521	50.24%	Private Sector	380	36.64%
Age			Private Business	105	10.13%
Under 18 years old	8	0.77%	Agriculturist	16	1.54%
18–24 years old	154	14.85%	Student	88	8.49%
25–34 years old	570	54.97%	General Employee	59	5.69%
35–44 years old	221	21.31%	Others	31	2.99%
45–54 years old	60	5.79%	Travel Frequency (per year)		
Over 54 years old	24	2.31%	1 time	497	47.93%
Education			2 - 3 times	343	33.08%
Primary School	22	2.12%	4 - 6 times	121	11.67%
Junior High School	29	2.80%	7 times and more	70	6.75%
High School	117	11.28%	Others	6	0.58%
High Vocational	70	6.75%	Purpose of the trip		
Bachelor's degree	635	61.23%	Visit hometown	119	11.48%
Master's degree	124	11.96%	Leisure	490	47.25%
Doctoral degree	40	3.86%	Business	241	23.24%
			Visit friends/ Relatives	125	12.05%
			Others	62	5.98%

3.2. Variables

This study had a total of 33 independent variables related to the measurement of ASQ, divided into seven main topics: 1) Access (4 variables); 2) Check-in Time (5variables); 3) Security (4 variables); 4) Airport navigation (5 variables); 5) Facilities (7 variables); 6) Environment (5 variables), and 7) Arrival Services (3 variables). All independent variables were measured using a seven-point Likert scale . This scale allows respondents to express their level of agreement or disagreement with the statements in each question. As a result, it is an appropriate measurement for studying

the ASQ 's expectations and perceptions. The responses were graded on scale of 1 (strongly disagree) to 7 (strongly agree). **Table 3** presents the descriptive statistics and reliability measures. The internal consistency of the service quality indicators group was assessed using Cronbach's alpha. The obtained values ranged from 0.875 to 0.932, which fall within the acceptable range (Hair et al., 2010).

Table 3. Descriptive statistics of Airport Users' Expectations and Perceptions.

Item	Indicators/Factors	Scale [a]	Expectation		Perception		Gap [b]
			$\bar{X}$	S.D.	$\bar{X}$	S.D.	
	Airport Accessibility		0.903 [c]		0.875 [c]		
1	Several options for ground transportation from and to the airport	1-7	6.200	0.948	5.940	0.847	-0.260
2	Adequate parking spaces	1-7	6.090	0.948	5.820	0.876	-0.270
3	Worth paying for the parking fee	1-7	5.980	0.941	5.720	0.934	-0.260
4	Availability of luggage carts	1-7	6.100	0.900	5.930	0.865	-0.170
	Check-in Time		**0.925** [c]		**0.906** [c]		
5	Suitability of waiting time for check-in	1-7	6.180	0.912	5.970	0.817	-0.210
6	Proficiency of check-in staff	1-7	6.160	0.894	5.960	0.807	-0.200
7	Politeness and assistance of staff in check-in procedures	1-7	6.150	0.858	5.960	0.841	-0.190
8	Passport verification time	1-7	6.150	0.870	5.950	0.844	-0.200
9	Politeness and assistance of airport inspectors	1-7	6.190	0.901	6.010	0.813	-0.180
	Airport Security System		**0.913** [c]		**0.896** [c]		
10	Politeness and assistance of security staff	1-7	6.180	0.895	6.020	0.793	-0.160
11	Effectiveness of screening passengers and their carry-baggage	1-7	6.190	0.853	5.990	0.822	-0.200
12	Waiting time for security inspection	1-7	6.170	0.867	5.970	0.822	-0.200
13	Feel safe and confident	1-7	6.210	0.872	6.050	0.819	-0.160
	Finding your way		0.921 [c]		0.915 [c]		
14	Ease of finding routes at the airport	1-7	6.220	0.852	6.040	0.812	-0.180
15	Availability of boards informing the flight information	1-7	6.230	0.816	6.030	0.822	-0.200
16	Walking distance inside the terminal building	1-7	6.150	0.857	5.970	0.836	-0.180

17	Ease of transferring to other flights	1-7	6.170	0.831	5.990	0.816	-0.180
18	Politeness and assistance of airport staff	1-7	6.240	0.838	6.090	0.783	-0.150
	Airport Facility Service		**0.930** [c]		**0.909** [c]		
19	Adequacy and quality of restaurants/shops within the airport	1-7	6.220	0.892	5.820	0.902	-0.400
20	Reasonable prices for restaurants/shops within the airport	1-7	6.090	0.953	5.700	0.987	-0.390
21	Availability of banks/kiosks ATM/money exchange	1-7	6.090	0.844	5.920	0.913	-0.170
22	Shopping zones	1-7	6.050	0.937	5.710	0.897	-0.340
23	Worth paying for shopping	1-7	6.060	0.921	5.640	0.937	-0.420
24	Internet service (Wi-Fi)	1-7	6.110	0.939	5.780	0.993	-0.330
25	Availability of business/executive Lounges	1-7	6.190	0.884	5.900	0.942	-0.290
	Airport Environment		**0.932** [c]		**0.909** [c]		
26	Availability and adequacy of restrooms	1-7	6.200	0.881	6.010	0.891	-0.190
27	Cleanliness of restrooms	1-7	6.210	0.870	5.980	0.883	-0.230
28	Convenience of waiting areas/areas for serving passengers	1-7	6.150	0.875	5.960	0.857	-0.190
29	Cleanliness of the parking building	1-7	6.150	0.894	5.950	0.874	-0.200
30	Atmosphere or decoration of the airport	1-7	6.210	0.878	6.020	0.854	-0.190
	Immigration System		**0.906** [c]		**0.902** [c]		
31	Passport/ID card verification at the immigration check-point	1-7	6.240	0.811	6.050	0.805	-0.190
32	Promptness of luggage delivery service	1-7	6.190	0.872	6.050	0.809	-0.140
33	Customs inspection	1-7	6.210	0.846	6.080	0.813	-0.130

Note: $\bar{X}$ = Mean, S.D. = Standard deviation, N = 1,037. [a] 1 (strongly disagree) to 7 (strongly agree). [b] Perception – Expectations. c Cronbach's alpha.

3.3. Methods

This study used decision-making modeling through CART to analyze ASQ data (Nicolini & Salini, 2006), as this method is useful in analyzing binary data and variables affecting or influencing dependent variables (Champahom et al., 2019). The dependent variables in this study are service user satisfaction, which is classified into Yes or No, indicating

that the mean overall satisfaction of the airport passengers was higher than that of all respondents. The main reason for choosing this variable as a dependent variable is to find the correlation and consider the variables or factors related to the ASQ indicators to further develop as a policy recommendation for Thai airports. The two models were established. Model 1 is an analysis of service user expectations for ASQ, referring to the customer's experience with airport services and their perception of what they obtain from them. These expectations often occur before traveling. Model 2 is an analysis of airport passengers' perceptions of service quality. The results of the service expectations are obtained from the airport users. Perceived service quality usually occurs after the users traveling. Consequently, the data used for analyzing the two models were derived from a questionnaire collected from 1,037 airport passengers. The statistical software IBM SPSS Statistics Version 26 (Liu et al., 2016) used the CART method for classification and regression. Differences in classification were in the form of target variables or dependent variables (Han et al., 2019). To classify accurate data, it is important to help identify differences between data sets related to dependent variables (Khan et al., 2015). In this study, the impurity measure in the data classification was performed in the Gini impurity formula. Regarding Binary Data Analysis, with the target variable or dependent variable is either "yes" or "no," the low value of the Gini impurity: G, facilitates the class extraction from the target variables or dependent variables, as shown in Equation 1 .

$$G_i = 1 - \sum_{=1}^{nk} p^2_{ik}$$

(1)

Where $p_{i,k}$ is the proportion of the number of data in node i . After testing the Gini impurity to obtain an optimal model, the accuracy and precision of classification were checked by using 10-fold cross-validation. To avoid excessive model adjustments, the maximum depth was determined to be five nodes. The minimum number of instances in the parent node was 50, and the minimum number of instances in the child node was 25. Therefore, classification helps analyze data and make more accurate decisions by using predictive variable data from the dependent variable for the decision-making (Champahom et al., 2019).

4. RESULTS

Gap analysis involves assessing the disparity between perception and expectation in order to determine the variables and items where perceptions surpass expectations (perception minus expectation). The results of the gap analysis are presented in **Table 3** and **Figure 1**. Notably, the nationalized items exhibiting significantly high gaps include G23 (Worth paying for shopping), G19 (Adequacy and quality of restaurants/shops within the airport), and G20 (Reasonable prices for restaurants/shops within the airport). With respect to the meaning of G23, it indicates that passengers have

a strong desire to engage in shopping activities at an appropriate price, whereas the actual situation in airport shopping zones is characterized by relatively high prices.

Figure 1. Gap analysis the airports service quality
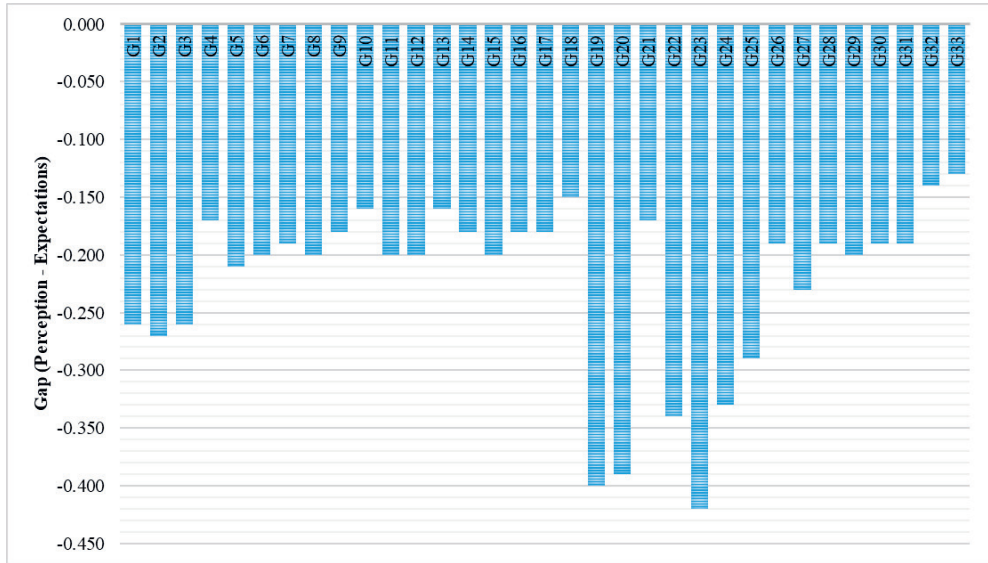
As regards the satisfaction analysis results (expectations and perceptions) of airport passengers using the CART method of both models, based on the classification to identify the accuracy and the forecast precision, Model # 1 has the overall forecast accuracy and precision value of 75.50% and Model # 2 has the overall forecast accuracy and precision value of 75.30%, which are both acceptable (details are shown in **Table 4**). It was found that Model # 1 had a forecast accuracy of 24.5%, while Model # 2 had a forecast accuracy of 24.7% (details are shown in **Table 5**) (Chansakul, 2018).

Table 4. Classification Table.

Observed	Predicted		
Model#1 Airport Users' Expectation			
	NO	**YES**	**Percent Correct**
NO	549	130	80.90%
YES	124	234	65.40%
Overall Percentage	**64.90%**	**35.10%**	**75.50%**
Model#2 Airport Users' Perception			
Observed	Predicted		
	NO	**YES**	**Percent Correct**

NO	609	70	89.70%
YES	186	172	48.00%
Overall Percentage	**76.70%**	**23.30%**	**75.30%**

Table 5. Errors in Forecasting Model.

Model#1 Airport Users' Expectation		
Method	**Estimate**	**Std. Error**
Resubstitution	0.245	0.013
Cross-Validation	0.284	0.014
Model#2 Airport Users' Perception		
Method	**Estimate**	**Std. Error**
Resubstitution	0.247	0.013
Cross-Validation	0.296	0.014

From the established model analyzing airport service user satisfaction, using the two models: Model # 1 Expectation (**Figure 2**) and Model # 2 Perception (**Figure 3**), the CART method can be described into four groups:

Figure 2. Airport users' expectation analysis model using the CART method
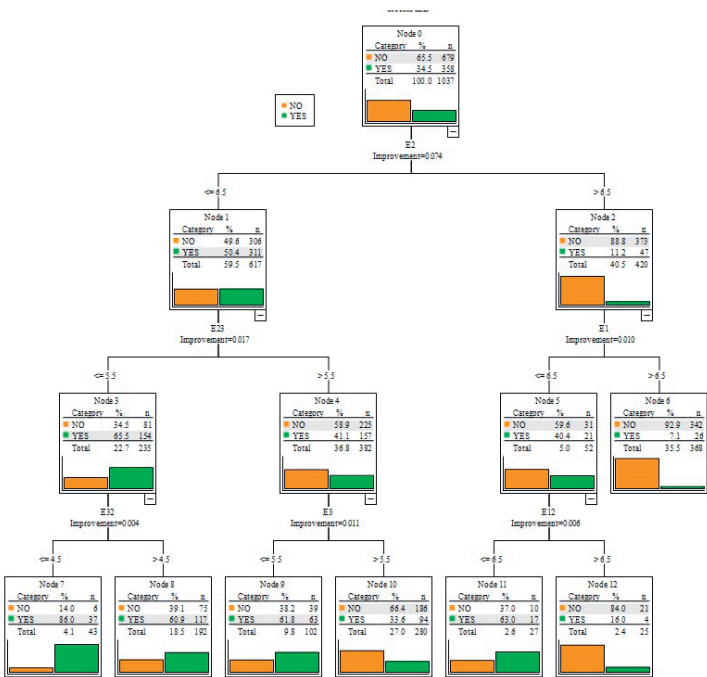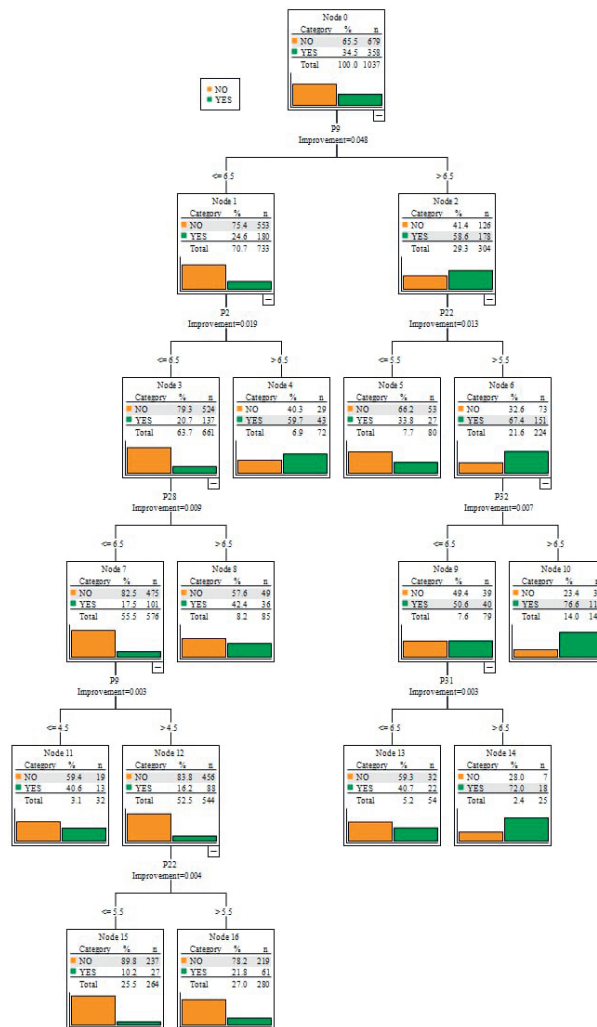
Figure 3. Airport users' perception analysis structure using the CART method

5. DISCUSSION

5.1. CART *methods*

Group 1, on the left side of Model # 1, found that service users expected sufficient parking areas available at the airport (E2) of less than or equal to 6.5. The proportion of satisfied customers was 50.4%. This resulted from the consumers' expectations toward

"worth paying for shopping" (E23), which was less than or equal to 5.5, with 65.5% of customer satisfaction, resulting from the consumers' expectations of promptness of luggage delivery service (E32) by more than 4.5 at 60.9% and less than or equal to 4.5 in the proportion as high as 86.0% due to service user satisfaction. These factors are related to their satisfaction. Users have reasonable expectations, which the airport operation can fully meet. The sufficiency of parking spaces at the airport is critical since it improves passenger convenience when entering and exiting the airport, as well as moving or delivering luggage to users and reducing the time required to reach terminals or board planes. This finding is derived from the study conducted by Jiang and Zhang (2016). One potential explanation for this outcome is that the presence of a parking facility at the airport contributes to improved traffic flow within the premises, leading to reduced time spent searching for parking spaces and decreased fuel consumption associated with circling in search of available spots. Additionally, having a parking facility helps alleviate traffic congestion at the entrance of the airport. When utilizing airport services, customers typically prioritize the selection of goods or services, pricing considerations, and overall value. Consequently, in order to incentivize customers to make purchases, it is crucial for airports or airport shops to offer high-quality products at reasonable prices that cater to the needs of the users (Otieno & Govender, 2016).

Group 2, on the right side of Model # 1, found that service users had an expectation of adequate parking spaces at the airport (E2) of more than 6.5, with 88.8% of the customer dissatisfaction caused by consumers' expectation of several options for ground transportation to and from the airport (E1) of more than 6.5, with 92.9% of user dissatisfaction. Conversely, users with expectations of less than or equal to 6.5 accounts for only 59.6% of dissatisfied users. The drop in expectations, which still results in the continued dissatisfaction of users, is caused by the expectations of waiting time for security inspection (E12) being greater than 6.5, with an estimated 84.0% of users unsatisfied. These factors significantly affect airport passenger satisfaction. This can be explained by the fact that user expectations in these areas are relatively high, but the airport was unable to meet them. The majority of airport users prefer traveling to the airport by private car (Pandey, 2016), and the majority of them prefer parking near the terminals for convenience and quick access to the airport. It is not always possible to find enough parking near the terminal to serve their needs. Some airports have parking facilities that are hundreds of meters from the terminals. The obtained result aligns with the findings reported by Jiang and Zhang (2016) who observed a significant relationship between the parking variable and a high gap. This suggests that airports should prioritize the provision of parking facilities to meet the demands of their clientele. The affects travelers' access to boarding gates, particularly when the number of service users increases. The size of the terminal building and the parking building should be increased, or an outdoor parking roof should be built. In addition, a footpath connecting the car parks to the terminal or vehicles that facilitate entry and exit from the airport should be provided. Currently, the airport is still experiencing the

effects of the COVID-19 pandemic, which has made its security system more intense, whether it concerns checking passengers who come to use the service, validating travel documents or immunization records, or checking baggage at both arrivals and departures at the airport (Rhoades et al., 2000). Thampan et al. (2020) discovered a positive correlation between the waiting times experienced by passengers at the baggage claim area and the overall performance of airports. Overall, these procedures or services cause system delays. To maintain its customers, the airport should urgently improve the service quality in this area.

Group 3, on the left side of Model # 2, found that service users' perceptions of politeness and assistance of airport inspectors (P9) were less than or equal to 6.5, with the proportion of 75.4% of user dissatisfaction (or lower than average satisfaction) due to consumer perceptions of adequate parking spaces (P2) being less than or equal to 6.5, with the proportion of the users' dissatisfaction reaching 79.3%. Customers were unsatisfied because their perception of the convenience of waiting areas/areas for serving passengers (P28) was greater than 6.5, with 57.6% disgruntled users, but their perception was less than or equal to 6.5, with the proportion of dissatisfied users as high as 82.5%. Such a high value resulted from the users' perception of the politeness and assistance of airport inspectors (P9), which was less than or equal to 4.5, accounting for only 59.4% of dissatisfied service usage, whereas the perception of service users over 4.5 accounted for 83.8% of user dissatisfaction. This was because consumer perceptions of shopping zones (P22) were greater than 5.5, accounting for 78.2% of dissatisfied consumers, while user perceptions of less than or equal to 5.5 accounted for 89.8% of dissatisfied users. Thus, service users perceive a low level of service quality because the airport services did not effectively serve their needs. An expression of politeness, friendliness, sincerity, honesty and the availability of staff are the top priorities of service users in airports and can produce a favorable first impression. This may lead to service users sharing their experiences with others. When it comes to services in the terminals, it is evident that the presence and sufficiency of shopping zones and comfortable waiting areas for passengers would make the airport more comfortable, convenient, and organized. This finding is in accordance with the study conducted by Lubbe et al. (2011), on the implementation of a model for assessing the service quality of airports in South Africa. The researchers highlighted that consumer satisfaction is influenced by several factors, including airport comfort and convenience, employee hospitality, security measures, and pricing of products or retail zones. Furthermore, passengers also take into account the accessibility and sufficiency of services provided outside the terminal area, such as available car parking spaces or parking structures, which can reduce the time required for baggage or luggage transfers.

Group 4, on the right side of Model # 2, found that the service users' perception of the politeness and assistance of airport inspectors (P9) was greater than 6.5, with 58.6% of satisfied users. This was due to consumers' perceptions of airport shopping zones (P22) being greater than 5.5, accounting for 67.4% of satisfied customers.

The promptness of luggage delivery service (P32) was greater than 6.5, with 76.6% customer satisfaction, however the proportion of their perception was less than or equal to 6.5, with satisfied service users accounting for just 50.6%. The value was reduced because users rated passport/ID verification at the immigration check-point (P31) as more than 6.5, with a high proportion of user satisfaction at 72.0%. It can be explained that users perceive a high level of service quality because the airport provides services meet their needs. Upon entering an airport, one of the primary aspects that users immediately notice is the level of expertise and proficiency demonstrated by inspectors stationed at various checkpoints within the airport premises. The competence of the airport staff, particularly the security personnel, has been emphasized by Liou et al. (2011); Sun and Huang (2022). This emphasis stems from the perception held by service users that inspections and security measures are vital for safeguarding their lives and belongings while entering the airport. Additionally, users seek convenience, efficiency, and secure delivery of their luggage, along with smooth immigration processes that involve document verification, passport checks, and COVID-19 vaccination certificates, an aspect that holds significance in light of the global pandemic experienced by all nations. Moreover, as illustrated in Figure 2, the availability of shopping zones within the airport should also be considered, as it not only generates revenue for operators and the airport but also contributes to the economic growth of the country at large (Lubbe et al., 2011).

5.2. *The Comparison Between the Two Models*

In terms of comparing the two models, it was observed that the proportion of dissatisfied airport users was identical, amounting to 65.5% (679 individuals). Upon examining the total number of respondents, it was revealed that both models shared common service quality indicators. These included the availability of adequate parking spaces (Tseng et al., 2008), various options for ground transportation to and from the airport (Rhoades et al., 2000), the perceived value of paying for parking fees and airport facilities. Rendeiro Martín-Cejas (2006), who suggested that the airport should have enough time for shopping in last-minute.

Additionally, other shared indicators included the efficiency of passport or ID card verification at immigration checkpoints and the promptness of luggage delivery services. This finding is supported by the study conducted by Fakfare et al. (2021) which highlighted the potential for improving overall service levels at airports through enhancements in the immigration check-in process. In addition to similar indicators, which can also identify similar variables that contribute to customer dissatisfaction with airport services, namely, appropriate parking spaces in the airport under the Access indicator with satisfaction results higher than 6.5 resulted in different outcomes. In Model 1, the proportion of unsatisfied users was as high as 88.8%, because a pre-trip satisfaction assessment led to the majority of users' expectations of the service they would receive equal to or greater than what they expected (Gilbert & Veloutsou, 2006).

Regarding Model 2, only 40.3% showed customer dissatisfaction. This resulted from the user's previous experience with the airport service, which allows them to comprehend how the airport services can suit their needs (Kurniawan et al., 2017). The service quality indicator for airport accessibility is critical to both models. Therefore, in order to meet the needs of airport users, the variables in this indicator requires improvement or revision to offer customers with satisfaction, resulting in repeat customers in the future

6. CONCLUSIONS

6.1. Key findings

User satisfaction analysis is critical to business development because it informs the determination of airport policy to boost service efficiency and promote customer satisfaction with the services while maintaining high service standards provided by the airport. Therefore, it is critical to study the variables that affect airport users' expectations and perceptions under the service quality indicators using statistical modeling in order to obtain an accurate and precise model and save time in analyzing variables that affect airport service users' expectations and perceptions.

Based on the survey and face-to-face interviews with 1,037 airport passengers across Thailand, as well as the review of relevant documents, the customer satisfaction level can be divided into seven levels, ranging from 1 (strongly disagree) to 7 (strongly agree). Seven indicators of the ASQ were also identified, including Access, Check-in Time, Security, Navigating the Airport, Facilities, Environment, and Arrival Services.

The decision tree model, CART, was developed using questionnaire data and a review of the literature. Model 1 and Model 2 showed an overall forecasting accuracy of 75.50% and 75.30%, respectively. According to Model 1, the presence of suitable parking spaces exerts a significant influence on the expectations of airport service users. This variable holds paramount importance as it directly affects users' satisfaction and is encompassed within the available parking options that users can readily observe and assess. Consequently, appropriate parking space has the potential to directly impact the overall satisfaction levels of service users. As for Model 2, the primary determinant that distinctly affects passengers' satisfaction is the courteousness and assistance provided by airport inspectors.

6.2. Research practical and theoretical implications

The recommendation for the model results, airports must develop and improve the service quality that is affected by this indicator. For example, there should be a sufficient number of luggage trolleys in the terminal to fulfill demand, an appropriate

number of parking spaces to accommodate service users, and the price and worth of paying money for parking should also be considered. These important indicators affect the service users' satisfaction and help them perceive the ease with which they can use the service. It was followed by the indications in group of Security, Facilities, and Arrival services, respectively.

The security indicator influences the service users' satisfaction because the airport can accommodate both domestic and international flights. To accommodate passengers of all ethnicities, languages, and cultures, security should be stringent from the airport's entry to the terminal, baggage checkpoints, passport verification points, and the boarding lanes. Airport security systems should create channels for users to communicate new security measures. Security should clearly explain the protocols, security procedures, and the rationale for implementing the measures in airports. Thus, skilled security employees should receive frequent training as well as a positive attitude toward service. In addition, the airport security system should international standard. Facilities represent what people can experience and perceive when using airport services. The airport should arrange sufficient facilities to meet the demands of those who use the service, such as restaurants, eating areas, waiting areas, retail areas, Internet/Wi-Fi service, restrooms, and so on.

- In addition to the above-mentioned facilities, the airport should also provide staff training on manners and emergency assistance to ensure that airport staff have the necessary skills and are ready to assist passengers at all times. Finally, there is a quality indicator for the Arrival Services. Arrivals at the airport must pass through the immigration checkpoint. Thus, airports must provide thorough and timely service, even if passports or paperwork for Coronavirus 2019 (COVID-19) immunization necessitate checks.

- The check-in process is now quite complicated. Airports should assign more inspection employees or police with specialized knowledge. This may include service-related skill training. Model 2 indicates that the variables affecting the perceptions of airport users are courtesy and assistance by airport inspectors. The Check-in Time service quality indicators, which are related to employee behavior and performance, have the greatest influence on service customer satisfaction.

- To respond to service user requests promptly, precisely, and equally, appropriate staff should be selected, regular training should be provided, and a positive attitude among employees should be fostered. This can help reduce check-in waiting times and passport verification times, which are then followed by the following indicators: Access, Facilities, Environment, and Arrival Service, respectively.

- Environmental service quality is another important indicator that affects customer satisfaction. Users generally consider the airport's overall environment because of the vast number of visitors that use airport services

on a daily basis, resulting in limited time to access the service due to the flight's determined time of arrival. The airport should develop a modern terminal that is designed and decorated to fit its surroundings. The surrounding area, both inside and outside the airport, should be clean and suitable for the airport users.

6.3. Research limitation and directions for future research

This study, however, is limited in that it only considers airports in Thailand and does not specify an airport. It also focuses on the application of classification and regression models to analyze and forecast airport passenger satisfaction. The findings showed quite a few effect variables. In addition, the study did not include any opinions or attitudes about the Coronavirus disease 2019 (COVID-19) situation as it affect the selection of airport services.

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