Exploratory of Tourists' Expectation on Airport Service Quality: Classification and Regression Tree Approach

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ABSTRACT

Currently, The major GDP of Thailand relies on tourism. Thus, the tourist has played essential roles in the economic deployment of Thailand. Air transportation almost selected for travellers in both foreign and domestic. The airports are the first impression for the tourists. An expectation of tourism is importance that is significant to the perceived a service quality of the airport. Because the airport is the first facility before going to the travelling places, this study aims to understand the tourists' expectations for airport service quality related to the passengers' satisfaction. We reviewed the service indicators from the previous studies of airport service quality. This study also tries to understand the relationship among the indicators. Thus, We used a classification and regression tree (CART) to analyze the data collection. The data was interviewed in the airport nationwide by the questionnaire of airport service indicators. The total data is 490 passengers who have travelling objective. We found the initial result that 68.6% is not satisfied with the airport service, who have the average of expectation gather than perception. According to the CART result, We found that the most critical indicator is an available parking space, the baggage carts, walking distance and internet access/Wi-Fi, respectively. This research can guide strategic management for airport efficiency improvements to support the tourists, especially when the Thai Government could handle the spread of COVID-19, many tourists would come.

Keywords: Thai Airport, Satisfaction, Decision Tree, Variables Importance, Strategic Management, Tourists.

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Introduction
Tourism in Thailand
A tourism in Thailand plays important role. Thus, The government organization must consistently improve any service for supporting either foreign and domestic tourists, efficiency. A study by Rouenthip and Laosumrit (2020) mentioned that income from tourism is a significant economy of Thailand. In 2019, the proportion was 16% of GDP. While the income from the foreign tourists was 10% of GDP and the total of tourism was 61% of Thai GDP. In 2020, foreign tourists cannot travel to Thailand because of the spread of COVID-19. This situation can be evaluated the tourists reduced to 80% or 8.1 million tourists. The recovering a tourism of Thailand has various ways. SCB Economic Intelligence Center (2020) has mentioned the example of creating confidence by the efficient safety policies of COVID-19. A subsidizing of travelling costs features such as the air ticket, makes the high price for travelling, and a reduction of the complexity of screening the passengers.

Regarding a transportation mode for tourism in Thailand, for inland transportation of domestic tourism, road transportation is almost used. However, for foreign tourists or across the region, air transportation is practically selected, because the air is a little the travel time and safer than the road transportation mode (Pothiphun and Ajnarong, 2018).

Role of Airport
Based on the previous section, we found that the service air transportation is essential to support the tourists. Which directly affect Thai economy and the country development as well (Rouenthip and Laosumrit, 2020). Thus, a government must emphasize the improvement of the service quality of the air industry. In addition, increasing the confidence of tourism can induces the number of tourists. That is a part of an economic stimulus. According to the air transportation has too many ways to improve the efficiency, such as the service qualities improvement of the airline (Chonsalasin et al., 2020a), the service qualities of the airport (Bezerra and Gomes, 2015; Allen et al., 2020b; Allen et al., 2020a; Chonsalasin et al., 2020b; Pandey, 2020). However, Pandey (2016) have mentioned that the airport is most important for tourists, because this infrastructure is bottleneck often which compromises the perceived service values.

Tourists' Expectation
Many guidance developments of the airport have been studied. Almost, they considered the users' perception, for example, the SERVQUAL model is used worldwide. However, an actual expectation of tourists is the passengers' expectation because it is a though before the service perception. Service quality expectations. In their definition of service quality as the consumer's judgment about an entity's excellence or superiority, Dean (2004) stated that customers evaluate quality by comparing their expectations (or ideals) with their perceptions of the service performance. Thus, an understanding of users' expectation cloud interprets as good guidance for increasing airport service quality. Ratanavaraha and Jomnonkwao (2014); Pandey (2016) have confirmed that the users' expectation impacts the perception of service quality.

Research Objective
The research aims to understand the relationship among the expectation of service quality in various dimensions such as the check-in point, arrival service, and airport environment, which related to tourists' overall satisfaction. The classification and Regression Tree (CART) is a method of this research.

Since, the CART can analyze the relationship between a target factor (airport service satisfaction) and the service quality indicators. Moreover, CART can demonstrate the relationship among indicator of airport service quality. The contribution of this study is finding ways to increasing the proportion of satisfied passengers. It could be a part of the strategic management of the airport.

Previous Research
Relationship Satisfaction and Expectation
Champahom et al. (2019a) concluded that satisfaction of service quality is users' comparing between their expectation and perception. If a user feels receiving service perception more than their service expectation, that user would satisfy that service quality. A study of public transportation by Chen et al. (2015) studied the impact of the innovation on the airport service quality for customer satisfaction and customer value enhancement. The result found that innovation development such as a self-check-in kiosk, X-ray, social media communication, and micro-hotels in an airport can significantly increase customer satisfaction. Chonsalasin et al. (2020b) studied the confirmatory factor analysis of airport service quality indicators. The result found that element of hands including Accessibility, Safety, Check-in facility, Wayfinding, Airport environment and Arrival Services.

Indicator of Airport Service Quality
According to the service quality indicator of the airport, there are various studies. For example, Tsai et al. (2011) studied a gap analysis. The multiple criteria decision analysis analyzed the data. The indicators consist of 2 primary groups, 1) Physical environment, including the airport facilities planning (e.g. sanitary condition of lavatory environment beauty and cleanliness, facilities allocation and space design) and the airport circulation planning (e.g. the internal direction line arrangement, exterior surrounding circulation planning, convenience of public transportation), 2) An interaction and outcome including, the procedural service (e.g. airport receptionist's attitude, security inspection procedure and check-in and baggage delivery service) and flight information service (e.g. an On-time departure of flights, clarity of broadcasting system and the accuracy of flight information board). The points of service separated the indicators. It was studied by Thampan et al. (2020), which including the total service time, the waiting time, space available per passenger (Crowding), a visibility Index, an orientation, total walking distance, and availability of seats, the walking speed and the number of carousels. The check-in point has accounted for a part of the service that important to the airport. A check-in point must give service to all of the passengers. The study of Taufik and Hanafiah (2019) focused on the service quality of check-in point. They collected the data by questionnaires. The confirmatory factor analysis was conducted to analyze the data set. The results found that there are three components indicated for the service quality of the check-in point. It includes Perceived Ease of Use (e.g., I would find it easy to get the information I need from the self-check-in kiosk). Perceived usefulness (e.g., The self-check-in booth enhances my effectiveness in completing the check-in process) Need for Human Interaction (e.g., I like interacting with a real person that provides the service). These indicators were confirmed, which statistical significantly related to a

comeback intention for the airports, regarding the studies the service quality of airport in Thailand, which is Donmuang airport (DMK). The indicators including Well-groomed boarding gate staff, Check-in staff appropriately attired, Check-in staff had equipment available to provide check-in service, Boarding gate staff checked documents with flights correctly, and the baggage service staff appropriately dressed (Pandey, 2016). In addition, many studies relating the service indicators of the airport around the world, Janic (2003); de Barros et al. (2007); Liou et al. (2011); Lubbe et al. (2011); Pabedinskaitė and Akstinaitė (2014); Bezerra and Gomes (2016); Pandey (2016); Pantouvakis and Renzi (2016); Lee and Yu (2018); Martin-Domingo et al. (2019); Barakat et al. (2021).

Method

Data collection and Sample size

The population of this study are passengers who used an airport service or called air passengers (exclude the relative who came to drop or wait to pick the air passengers). This paper target only the air passenger who has tourist objective. The statistics of air passenger of Thailand in 2019, the domestic were 76,253,599 passengers and International were 88,822,412 passengers (Total = 165,076,011 passengers) (The Civil Aviation Auhority of Thailand, 2020). This study's sample size is considered by the applied method, which is the classification and Regression Tree Model (CART). There are many 'rules of thumb' about the proper sample size. The typical rule is to have at least 10–15 participants per observed variable (Field, 2009). Nevertheless, Comrey and Lee (1992) defined the following ranges:

100 as poor, 200 as fair, 300 as good, 500 as very good, and 1000 or more excellent (Hernandez and Monzon, 2016; Hernandez et al., 2016).

The data collection of this study was 490 respondents. The collected data was in the airports in Thailand. A cluster sampling is used by considering the number of passengers each year proportionated the number of respondents in each airport. The interview was conducted by a questionnaire then answer by the respondents. The period time for the data collection was March 2019 – May 2019.

Questionnaire design

A quarantine component included two parts, 1) the question of sample characteristics such as Gender, Passenger's age, Educations, Occupation, Revenue, Frequency and Delay Experience. 2) the expectations of airport service qualities, the list of indicators was conducted by a literature review (see in section 2). Which consist of 7 groups including, Access, Check-in Time, Security, Finding your way, Facilities, Environment and Arrival Services (Chonsalasin et al., 2020b; Barakat et al., 2021). A 7-point Likert-type scale measures the total service quality indicators (1 = strongly disagree; 7 = strongly agree). Ethics Committee approved this research for Researches Involving Human Subjects, Suranaree University of Technology (COA.30/2562).

According to the sample, characteristics was shown in Table 1. The satisfied passenger and unsatisfied passenger separated it. Overall, almost all passengers are unsatisfied 68.6%. For the gender, it was found that the females more than the males. Nearly all education level is bachelor's degree. Regarding the reliability of the item of passengers' expectation, It can

be measure by a Cronbach's Alpha (Champahom et al., 2020; Chonsalasin et al., 2020a). The Cronbach's Alpha of this data is 0.978, which could be accepted to be a good questionnaire criterion.

Classification and Regression Tree

The decision tree model (DT) consists of three components. These are decision node, branches, and leaf nodes. Each decision node displays the variable, and each branch displays one variable value based on decision rules, while leaf nodes exhibit the expected values of target variables (Champahom et al., 2019b). The advantage of a DT is showing the relationship among the exploratory indicator (which in this study is the service quality of the airport) (Chou, 1991). In addition, the strength of DT is an analysis of either Continuous and discrete data. The regression tree method constructed continuous data (Lee et al., 2007) and classification tree (Berry and Linoff, 2000). The classification and regression tree (CART) cloud analyze either Non-parametric and non-predefine (Hernandez et al., 2016). CART is a part of the data-mining method (data-mining is a part of machine learning). It was developed by Breiman et al. (1984). the previous researchers analyzed the dataset by using CART. For example, Barlin et al. (2013); Hwang et al. (2013) analysis in the subject of medical or energy (Mikučionienė et al., 2014). An application for the transportation engineering studies such as the transportation mode decision (Koo et al., 2014). The relationship between contribution factors affecting the crash severity from the road crash (Chang and Wang, 2006; Pakgohar et al., 2011). An analysis of important factor affecting the transportation service (de Oña et al., 2012). And a study used the CART to identify the importance of variable ranking service indicators (Importance-independent variable) (Hernandez et al., 2016).

Split rule and validation tree model

Classification and Regression Tree (CART) was used to analyze passengers' expectations for airports' service quality. A targeted variable (dependent variables) is passenger satisfaction (Champahom et al., 2019a), which indicated a customer is satisfied or not? This variable was suggested by the overall expectation and overall perception of the air service. Suppose the average perception is gathering than the expectation (Fakfare et al., 2021). The satisfied variable was defined as 0=not satisfied and 1= satisfied.

The DT model component included three parts consisting of a decision node, branches, and leaf nodes. Within the structure of DT, each decision node will demonstrate the variable. Its branch will show the value of variables created from the decision rules, and leaf nodes are the expected value of the target variables (Song and Lu, 2015).

Table 1 Sample Characteristics

		SATISFIED					
		NO			YES		
		Count	%	Mean	Count	%	Mean
GENDER	Male	156	46.43%		69	20.54%	
	Female	180	53.57%		85	25.30%	
AGE				31.47			30.38
EDUCATION	Primary School	9	2.68%		2	0.60%	
	Junior High School	13	3.87%		3	0.89%	
	High School	44	13.10%		22	6.55%	
	High Vocational	23	6.85%		16	4.76%	
	Bachelor degree	202	60.12%		93	27.68%	
	Master degree	33	9.82%		14	4.17%	
	Doctoral degree	12	3.57%		4	1.19%	
REVENUE				27,423.07			24,602.08
OCCUPATION	Government Officer	103	30.65%		57	16.96%	
	Private Sector	134	39.88%		49	14.58%	
	Private Business	32	9.52%		12	3.57%	
	agriculturist	4	1.19%		3	0.89%	
	Student	28	8.33%		17	5.06%	
	General Employee	24	7.14%		13	3.87%	
	Others	11	3.27%		3	0.89%	
FREQUENCY	1 week at a time	0	0.00%		0	0.00%	
	2 weeks at a time	7	2.08%		4	1.19%	
	1 month at a time	8	2.38%		2	0.60%	
	2-3 month at a time	33	9.82%		15	4.46%	
	4-6 month at a time	107	31.85%		36	10.71%	
	1 year at a time	179	53.27%		96	28.57%	
	others	2	0.60%		1	0.30%	
Delay Experience	Yes	161	47.92%		86	25.60%	
	No	175	52.08%		68	20.24%	

The Statistical Package for the Social Sciences (SPSS) was used to analyze the dataset. According to the analyses process of DT on SPSS, A starts by separating the whole dataset following by node. The node related to the proportion of the target variable, then the splitting will be begun to create few small subsets. For a splitting or in SPSS called "growing methods", there are three types: CHAID, Classification and regression tree (named in SPSS is CRT) and QUEST. Each type is different working and also its advantages. This study used the CART (Champahom et al., 2019b). The reasons are, 1) CART can analyze binary node splitting, which is easy to understand (Chang and Wang, 2006) and 2) CART can set influence variables, referring to the research objective, it must analyze the relationship among the satisfaction of passenger. CART will show

each independent (predictor) pattern of ranks, relating to its importance to the model (IBM, 2012). Previous research used CART, for example, Pande et al. (2010); Kashani and Mohaymany (2011); Pakgohar et al. (2011). In addition, CART aims to find maximized within-node homogenous. The extent to which a node does not represent a homogenous subset of cases indicates impurity. (IBM, 2012).

For the CART model development, the algorithm of a splitting must be considered. A CART type in SPSS, there are two splitting rules, including Gini and Towing. The Gini splits frequently used. A working of Gini split is splits found that maximize the homogeneity of child nodes concerning the value of the dependent variable. Gini is base on squared probabilities of membership for each category of the dependent variable. The readers are suggested for the detail as Kashani and Mohaymany (2011); IBM (2012); Chang and Chien (2013).

Considering the accuracy of CART, it could use a unit misclassification costs, which mean accuracy rate for comparison between the observer data and the predicted by the model (Khan et al., 2015).

A validation defined an optimal tree model. Ten-fold cross-validation is several options to select the appropriate tree size. To avoid the overfitting of a model, We must set the limitations of a tree model. This study defines maximum tree Depth=5 nodes, the minimum cases in parent node=50 and minimum cases in child Node=25 (Champahom et al., 2019a).

Results and Discussion
Descriptive Statistics

Table 2 show the descriptive statistics of users' expectation for airport service qualities. Overall, the average score is 6.03 - 6.27, S.D. = 0.80 - 0.97. The high expectation may be from the convenience of high service quality from the airport such as cleanliness, the speed of progress, i.e., The highest service indicator is "Atmosphere or decoration of the airport" and "Checking Passport/ Identification Card at the Immigration Checkpoint". The lowest expectation is the value for money of Parking facilities. The rationale might seem that most passengers were dropped off or access the airport by public transportation (e.g., Taxi and Bus). Thus, available parking may not be necessary for the tourists.

Model Accuracy

Result of classification and regression tree (CART), dimension of the accuracy, it could be considered by two parts, 1) the risk of cross-validation is 0.273 (S.D.=0.02), this could be interpreted that the percentage of error = 27.3% (accuracy rate = 72.7%), 2) the classification to compare the observations and predictions the satisfaction of passenger. It shows that percentage correct = 75.7%. We could accept a high accuracy rate and interpretation for policy development next (Champahom et al., 2019b).

Table 2 Descriptive Statistics

Indicator	Description	Mean	S.D.
E1	land transportation has a variety of alternatives, both to and from the airport"	6.23	0.94
E2	Sufficient parking spaces	6.11	0.97
E3	Value for money of Parking facilities	6.00	0.97
E4	Availability of baggage carts/ trolley	6.14	0.91
E5	Courtesy and helpfulness of security staff	6.22	0.91
E6	Effectiveness of security inspection"	6.17	0.91
E7	Waiting time for Safety inspection	6.19	0.85
E8	Feeling of being safe and secure."	6.17	0.89
E9	Waiting time in the check-in line	6.23	0.89
E10	The efficiency of check-in staff	6.22	0.90
E11	Courtesy and helpfulness of check-in staff	6.22	0.83
E12	Waiting time at passport inspection	6.23	0.87
E13	Courtesy and helpfulness of inspection staff	6.24	0.89
E14	Sufficiency and quality of restaurants/ shops inside the airport	6.26	0.86
E15	Value for money of restaurant/ eating facilities	6.26	0.80
E16	Availability of ATM/ Bank/ Money changers	6.18	0.90
E17	Shopping facilities	6.19	0.85
E18	Value for money of shopping facilities	6.30	0.82
E19	Availability of Internet service (Wi-Fi)	6.25	0.85
E20	Availability of Business/ Executive Lounges	6.08	0.96
E21	Ease of finding directions at the airport	6.12	0.85
E22	Flight information screen	6.03	0.96
E23	Walking distance in the passenger terminal	6.06	0.95
E24	Ease of connecting other flights	6.14	0.93
E25	Courtesy and helpfulness of airport staff	6.23	0.87
E26	Availability and adequacy of restrooms	6.25	0.84
E27	Cleanliness of washrooms/ restrooms	6.24	0.87
E28	Comfort in the waiting area for passengers	6.20	0.87
E29	Cleanliness of airport terminal	6.20	0.90
E30	Atmosphere or decoration of the airport	6.27	0.87
E31	Checking Passport/ Identification Card at the Immigration Checkpoint	6.27	0.81
E32	Speed of Baggage delivery service	6.21	0.86
E33	Custom inspections	6.22	0.86

Important variables

Initially interpreted classification and regression tree model (CART) could be considered the importance of the variables, which demonstrate the relationship between the independent and dependent variables (Figure 1). This study are the airport service indicator and overall satisfaction of passengers in binary form. The 33 service indicators (Champahom et al., 2019a). The high relationship of indicators (maximize the homogeneity) is E19: Internet service

availability (Wi-Fi). It means that the service of internet access most affects the passenger satisfaction for the airport service. It might be explained that the current social media are always used, especially during the waiting. Many passengers may do not have the 3G or 4G to access the internet. The results consistent with Chang and Chien (2013) found that the Wi-Fi is a part of the airports that were most comments in the Google reviews. The following impotence variables follow, E2: Sufficient parking spaces and E20: Availability of Business/ Executive Lounges, respectively.
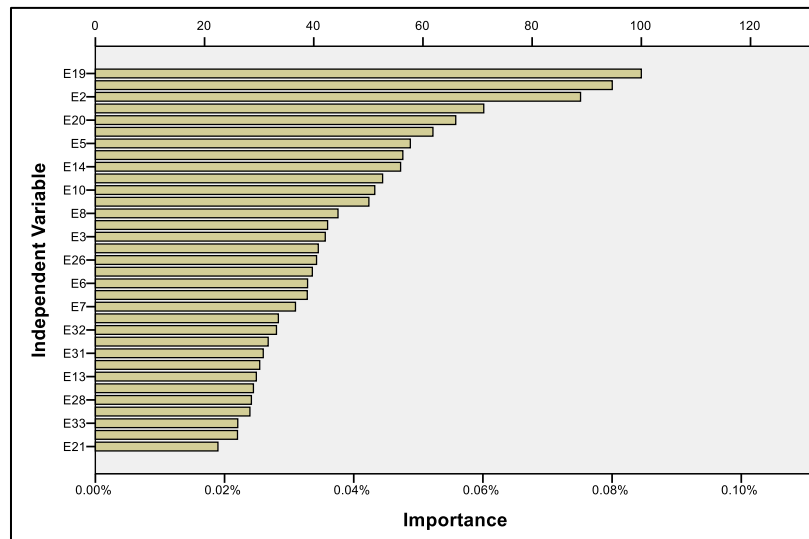
Figure 1 Normalized Importance Variables

Classification and Regression Tree Model

The result of the Classification and Regression Tree model (CART) was shown in Figure 2. When considering the passengers' satisfaction, we found that 68.8% is unsatisfied tourists (336 passengers). In contrast, 31.1% received service gather trans their expectation. The first homogenous variable for splitting the passenger satisfaction is E2 Sufficient parking spaces. If the tourists have expected more than 6.5, almost all will be unsatisfied (90.1%). While the expectation is less than 6.5, almost all passengers are also unsatisfied (53.3%). These parking space results can be explained that the parking relatively is not increased the passengers' satisfaction. In other words, these passengers who give high expectation are not satisfied.

This result is consistent with Thampan et al. (2020), who reviewed for evaluating the overall service Qualities. We did not find that the parking service is the majority of airport service indicators.

The subsequent variable is in a group of 287 passengers who give expectation less and equal 6.5. That is E4 availability of baggage carts/ trolley. If the expectation of E4 less than 5.5, that passenger will be satisfied with the overall airport services (64%). While the expectation of E4 gather than 5.5, the main passengers are unsatisfied (62.6%). The service quality of the baggage carts cloud is demonstrated a little bit of the attitude of a passenger. We could account that the baggage carts service has an impact on the tourists' satisfaction. If they get a high perception about

baggage movement service, they will become satisfied passengers. The results are supported by the study of Lee and Yu (2018), who conclude that if the airport service has an availability of baggage carts is necessary, it should be progressed continuously for the convenience of the passengers.

Another variable that was clarified relating to the passenger's satisfaction is E23: Walking distance in the passenger terminal. If the tourist gives a high expectation for this indicator, they would be unsatisfied. This result is supported by Bezerra and Gomes (2016) found that walking distance is significantly statistical to be the indicator of airport services. The research about the expectation of walking distance is significant (Chonsalasin et al., 2020b).

Another node of E2 is expecting more than 6.5. The child node is the Availability of Internet service (Wi-Fi). This indicator rather crucial because the tourist has a high expectation or necessity about internet access. The CART result shows that if Wi-Fi's expectation more than 6.5 will be unsatisfactory for 96.2%. Likewise, the anticipation of Wi-Fi indicator less than 6.5, almost passenger also unsatisfied. Accounting to research found that comment on social media such as Twitter, the Wi-Fi is a word which most comment for the airport service (Barakat et al., 2021). The results consistent with Martin-Domingo et al. (2019) mentions that a sentiment Analysis technique can identify new insights beyond those provided by more traditional methods for an airport service quality. Pandey (2016) have found that the passengers have high expectation about facilities such as Internet access/Wi-Fi. The internet service in the airport should be kept up the good work.

Conclusions and Implementations

This study proposes to understand the airport service quality indicators in a dimension of passengers' expectation. We used the classification and regression tree (CART) to analyze the dataset. The CART has the advantage for indicating the relationship among the service indicators and ranking the homogenous of splitting the passengers' satisfaction. The questionnaires collected the data in the airports in Thailand. The contribution of this study is using for the guidance of airport efficiency and strategic management of development as well.

The results of the CART model found that the highest expectation is the service parking. However, these passengers are not satisfied with the airport service. It means that the main airports have enough parking space. There is no need to improve quickly because it did not increase the passengers' satisfaction.

The service indicator that should be developed including, 1) the availability of baggage carts/ trolley. It could be explanted that if the perception of the baggage cart's function has increased, this will make the passenger became to be cumulative passengers' satisfactions. Regarding a recommendation, the airport should observe or survey the demand of the carts, then evaluated adequacy. The airport should provide the baggage carts, aplenty. The airport administrators are suggested to check this indicator because it is easy and low budget to process. 2) the walking distances, the result show that this indicator cloud increases passenger satisfaction. Most tourists would take much baggage in each travelling.
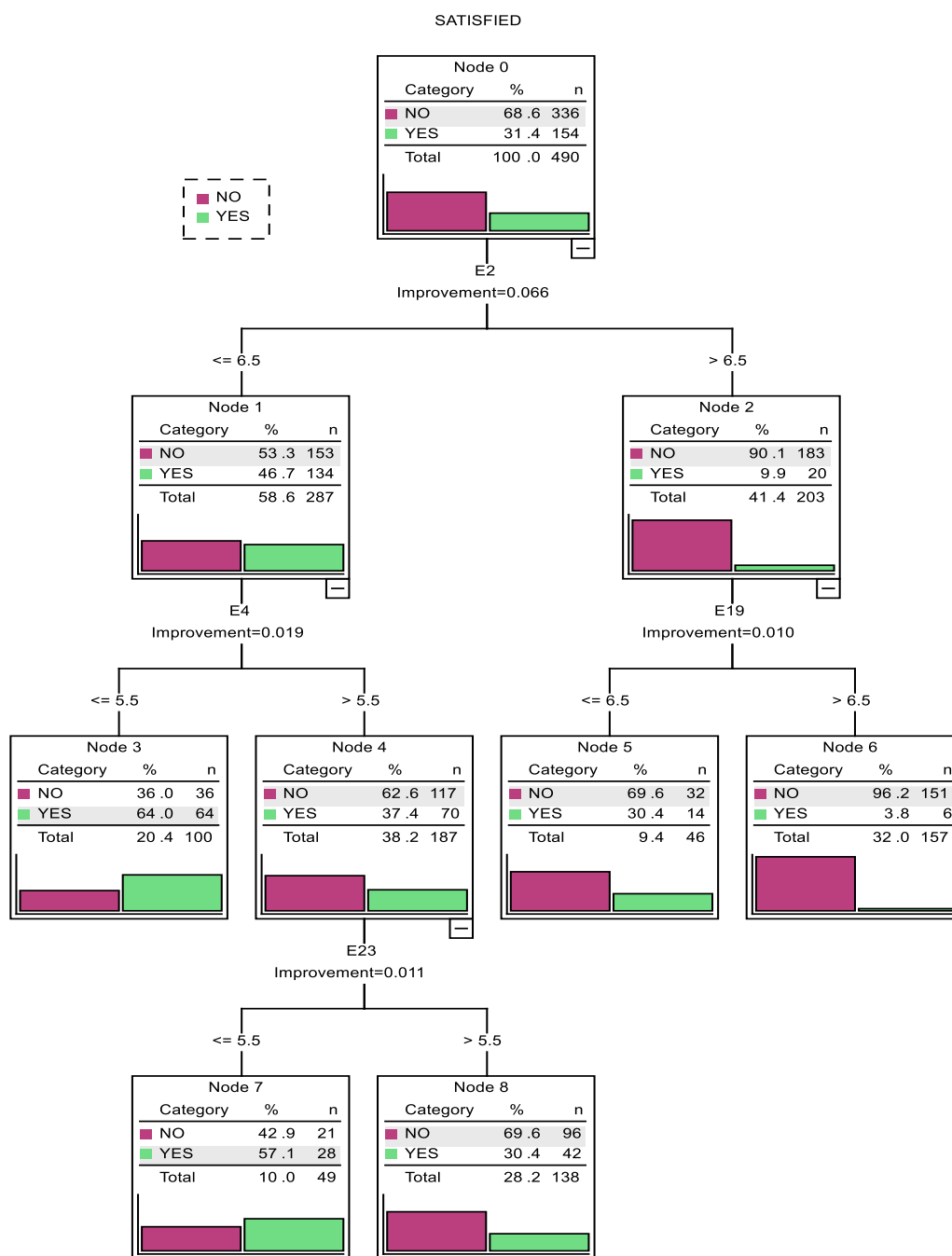
Figure 2 Classification and Regression Tree Results

Thus they did not like the long walking distance, such as between the check-in point to the gate. However, this improvement relatively is challenging to improve because this depends on the airport's layout. But The administrator should consider some method. For example, a proper mobility solution may help minimize the time and uncertainty for tourists when moving within the terminal and allow passengers to stay more relaxed at their interaction with the airport setting (Bezerra and Gomes, 2016). Another recommendation has a high chance to increase the proportion of satisfied passenger. It is the service of internet access or Wi-Fi. The result indicated that the airport should continuously improve the Wi-Fi, such as the available internet signal and the internet speed.

Recommendations for further study

The limitation of this study is data surveying before the COVID-19 spread, which has too much impact on the air industry. Thus, the questionnaire will lack some service indicators of the COVID-19 protection in the airport. However, when the Thai Government could handle the spread of COVID-19, then opening the country will be occurred, too many tourists will come. This paper could be helpful.

Acknowledgment

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