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The Impact of Airport Facility Service Quality on Brand Experience and Passenger Satisfaction: Considering the Mediating Role of Brand Engagement

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Abstract: In the past decade, as more and more passengers choose to fly on trips, China's airport infrastructure construction has achieved world-renowned achievements. Despite the growing opportunities and demands for using brand research to assist airport industry services in improving, few studies have investigated the impact of service quality in terminal facilities on brand due to the diversity of service. This study uses structural equation models based on empirical research to explore the impact of facility service quality, including processing facility and non-processing facility, on airport brand experience and passenger satisfaction. This study also aims to assess the mediating effect of brand engagement on the relationship between facility service quality, brand experience, and passenger satisfaction. At the same time, this study also uses importance–performance map analysis (IPMA) to find specific items influencing brand engagement. The sampling method used a random sampling approach, with a total of 186 questionnaires distributed at Shanghai Pudong International Airport for data analysis. The results show that airport facility service quality is significant for brand engagement and experience, as well as for satisfaction, especially for processing facilities. In addition, the IPMA results show that facility services involved in the check-in process is of high importance, which requires more attention from managers. Overall, the findings of this study extend the understanding of service quality, brand engagement, brand experience, and passenger satisfaction in the context of an international airport, and they offer implications for Shanghai Pudong International Airport regarding the improvement of its facilities and brand.

Keywords: airport facility service quality; brand engagement; brand experience; passenger satisfaction

1. Introduction

Passenger traffic increased significantly, from 67,220 million in the year 2000 to 659,930 million in 2019; simultaneously, the total number of employees in the Chinese air transport industry, nationwide, was 623,543 in 2019 [1]. Beginning in 2020, Coronavirus disease 2019 (COVID-19) has affected nearly every country in the world. The air transport industry ranks as one of the worst affected industries. For Chinese airlines, domestic passenger demand declined by almost 60% in 2020 as compared to the previous year [2]. In this context, airports are focused on developing service strategies to ensure passenger satisfaction and experience, and their facilities are steadily gaining more attention as part of that purpose. Facility service quality is an important dimension of the quality of airport services, which involves the various facilities related to passengers, from the moment they arrive at the airport to the moment that they pass through the security inspection and embark, including those they use for activities during their spare time in the terminal, such as resting, going to the bathroom, and any other activity provided by the airport [3]. Facility service quality consists mainly of supporting and enhancing the quality, safety, and environmental friendliness of products, services, and processes [4]. In other words, facility service quality is an extension of a service quality theory that focuses on infrastructure. It can be divided into processing and non-processing facility service quality, based

on passenger movement. Considering the importance of China's air transport industry for the economy, it is important to develop studies that promote the improvement and optimization of facilities at airports, as well as to increase the quality of their services [5].

Brand equity is primarily known as customer-based brand equity, which is an important part of measuring a brand. It represents the value that a brand adds to its services and products [6,7]. For an airport, the power of its brand lies in what passengers feel, see, and hear about it, thanks to their engagement and experiences. Therefore, brand engagement and experience could be the measures of brand equity for the airport industry. However, little to no research has examined how facility service quality can develop brand equity. Thus, this study is designed to begin filling this gap by revealing how airport facility service quality influences brand engagement and experience. Moreover, this study also reflects the performance and importance of airport facilities in explaining brand engagement by using IPMA in order to suggest improvements to these facilities.

Providing comfortable, convenient, and safe facilities could attract passengers using these facilities, which would improve passengers' satisfaction. According to the literature, the service quality at an airport can influence passenger satisfaction [8,9]. Under the influence of airport brand, passengers' satisfaction could vary depending on their level of brand engagement. In contact with the brand, people's active participation could lead to a deeper experience and bring satisfaction. A limited number of studies have considered the effect of airport brand engagement on airport brand experience and passenger satisfaction [10,11]. However, the question remains: Will incorporating brand engagement in facility service quality help to increase brand experience and passenger satisfaction? It is the focal problem that this study addresses. Therefore, the assessment of brand engagement for an airport may constitute a key mediating mechanism between facility service quality and brand experience, as well as between facility service quality and satisfaction.

There have been many studies on the impact of service quality on brand, but few focus on the quality of facilities during the operational process of the airport industry. Previous studies neither pay enough attention to the core elements of an airport facility nor clearly explore the influence path of airport brands from the passenger's perspective. This study aims to investigate the impact of facility service quality on brand experience and passenger satisfaction with brand engagement as mediators, and the main objectives of this study are as follows:

1. This study constructs a reflective model of airport facilities, reflecting brand experience and satisfaction at the same time, choosing brand engagement as the mediating factor, and using structural equation models to explore the impact of facility service quality on airport brand and satisfaction.
2. This study also explores the influence of processing and non-processing facility service quality on brand engagement and experience and passenger satisfaction, respectively, so as to enrich the understanding of airport facility service quality measurement patterns.
3. Since brand engagement is an important mediating factor in this model, this study uses importance-performance map analysis to analyze passengers' perceptions of the importance–performance of airport facilities to find ways to improve brand engagement and extend the results of PLS-SEM by taking the performance of facility indicators into account.
4. This study also provides international airports with practical guidance on how to manage facilities and how to convert facility service quality into brand equity and passenger satisfaction.

To achieve the objectives of this study, the background literature is presented in Section 2, and the development of the hypotheses and the structural model connecting the constructs are contained in Section 3. The methodological procedures are described in Section 4. The data analysis is presented in Section 5; and, in Section 6, the results are discussed. Ultimately, Section 7 highlights the theoretical and managerial implications, as well as discussing the study's limitations.

2. Theoretical Background

2.1. Shanghai Pudong International Airport (PVG)

Shanghai Pudong International Airport was completed in 1999 and is now the major international airport serving both Shanghai and mainland China. Considering the record-setting economic growth of China, especially in Shanghai, PVG is of great importance to passengers. The airport boasts an 80-million-passenger annual carrying capacity. Over 70 million passengers were processed by the airport in 2019, and even with the impact of COVID-19, there were still more than 30 million passengers handled in 2020, which caused PVG to be ranked as the 14th busiest airport in the world. Brand Finance, a UK brand valuation agency, announced its *Brand Finance Airports 25 2020* ranking, and PVG ranked 7th in the world, with a brand value of $401 million [12]. The airport has many modern facilities. Transportation options to convenient locations in Shanghai include the metro, bus lines, taxis, shuttles, and a magnetic levitation train. Despite the impressive facilities at the airport, passengers lament its service quality [13]. Therefore, assessment of airport service quality is central to service improvement, which may have impact on airport brand.

2.2. Facility Service Quality

Facility service quality, as a part of overall service quality, is an essential factor in determining the success of some industries. Airport terminals offer a variety of services to passengers to guarantee their satisfaction and comfort. Airport Council International (ACI) defined "Overall Service Quality" as the "Overall level of passenger satisfaction as measured by survey responses" [14], which has become a key competitive capability as it has a significant impact on business performance, return on investment, satisfaction, brand equity, and profit [15,16]. The airport industry has embarked relatively late on the journey of quality management change as compared to other service industries [17]. As an integral part of airport operations, facilities management has a significant impact on user perceptions, satisfaction, and production [18]. Among the studies on service quality, many of them also involve physical facilities. When passengers arrive at the airport, they need to check-in, go through the security check and board, so they cannot avoid interacting with the related facilities at airports. Airports also offer various shopping and entertainment services, such as retailers, restaurants, cafes, and so on, which passengers can enjoy, thus resulting in greater connection with an airport facility. Therefore, research on the quality of airport facilities is necessary in the field of service quality [10,16]. At the same time, to become an airport of excellence, the airport's management must also be determined to improve the quality of the service of its infrastructure, such as the layout accessibility, seating comfort, electronic equipment and displays, cleanliness, etc. [9] Facility service quality provided by an airport is a critical determinant of airport brand impact and positive passenger response. However, there is little research available in the literature on passenger satisfaction and brand experience as they relate to facility service quality in the Chinese airport industry, despite the growing importance of service quality in the non-price competitive arena [19,20].

In the airport environment, half of the service facilities lie in the processing, and half in the non-processing, domain [21]. Processing facilities include all facilities needed for compulsory activities that must be completed in an orderly manner, while non-processing facilities provide the various optional facilities present at all stages of passenger travel. *Planning and design of airports* [22] has divided the airport terminal into three functional areas: The access interface, consisting of the enplaning and deplaning curbs and the transit platforms; the processing facilities, consisting of the ticket counters, baggage deposit, passport counters, baggage claim, customs facilities; and the flight interface, consisting of the hold rooms, waiting lounges, stairs, and ramps. Similarly, Correia, Wirasinghe [23] later classified the terminal facilities into six types based on purpose: the curbside, ticketing counter, baggage drop, security control, departure lounge, circulation areas, and concessions. Based on the above study, this paper refines the classification of processing and non-processing domains based on the movement of passengers, forming two passenger-

centered facility indicators. On the one hand, passengers can obtain the basic services of the airport through the functional areas, and on the other hand, they can choose and enjoy more diverse services from the non-processing facilities [3]. The two indicators are shown as below:

1. Processing domain, including the four primary processing domains at airport terminals: check-in, security screening, immigration and customs, and the boarding (or departure) lounge [21,24]. The prime, or uninterrupted, facilities are said to be demanded by passengers. Eight facilities items are used to measure this indicator.

2. Non-processing domain, including seven service items: restrooms [25], pre-boarding waiting areas [26], baggage trolleys, Wi-Fi service [27], information sources, walking distances, and shops [3].

2.3. Brand Engagement

Within the context of academic research, there is a consensus on the importance of understanding engagement and the paradigm shift in consumer–firm interactions that it represents [28–30]. Brodie, Hollebeek [31] define consumer brand engagement as a psychological state of an individual that occurs in an ongoing, dynamic engagement process involving cognitive, emotional, and behavioral dimensions of brand-related activities. Obinna, Ellis [8] define brand engagement as a series of non-transactional consumer behaviors displayed because of their interest in and commitment to brands. Wiktor [32] also refers to consumer brand engagement as comprising behaviors that are related to social media or online brand communities and brand-focused activity during, or related to, specific consumer–brand interactions.

For the airport industry, brand engagement helps to trigger favorable behavioral intentions towards the airport brand [33]. A passenger's engagement with the airport brand is an emotional bond between the brand and the passenger, which is a way to value co-creation [34]. Brand engagement is a dynamic process of interaction between passengers and the airport throughout the travel experience [35]. It is a neutral term without any positive or negative connotations, while interaction can have positive or negative effects. Passengers can advertise this airport's services, facilities, staff, and even the airport brand itself based on their activities at the airport. At the same time, the efforts that airports make to reach out and obtain some form of connection with the passengers, such as by being open to passenger feedback, also serve to improve brand engagement [29], Brand engagement is common in airports. Passengers will be relatively dissatisfied due to poor facilities, services, or even brand interaction [36]. In this way, we should explore new mechanisms to promote brand engagement. Passengers tend to provide feedback related to facilities and services based on their engagement with the airport [37], which encourages airports to scrutinize facility-relevant services. Thus, brand engagement has the potential to improve facility service quality, and, to our knowledge, this relationship has not been empirically examined, especially in international airports, which attracts our attention.

2.4. Brand Experience

Brand experience is the individualized feeling of the customer in response to certain experiences of the brand. In other words, brand experience is the customer's specific experience and feeling of the brand. A brand provides both functional and experiential values, which often result from brand experience [38]. When customers engage in a brand experience, they feel emotionally connected and excited about the product and the service quality [39,40]. Brand experience is not limited to a single experience at one touch point; rather, it involves the cumulative experiences of different touch points at different phases of the consumption journey, either pre- (e.g., consumers evaluate different alternatives and anticipate the experience with the brand organization), during (e.g., encompassing the sensations felt), or post-consumption (e.g., the memory of the experience) [38]. Different components of experiences can emerge in a service encounter, such as sensory (related to the experiences felt though our senses), affective (related to sentimental interactions), be-

havioral (related to actions taken by consumers who enjoy the experience), and intellectual (related to the rational thoughts that emerge due to the experience) [41].

Passengers' experiences with an airport brand create emotional, sensory, and physical connections. Passengers' active participation will lead to deeper feelings [42]. Airport brand experience is about making the brand part of the journey by engaging passengers actively and enhancing their experiences. Airport brand experience encompasses the emotional and behavioral processes between passengers and objects in the airport as well as between passengers and staff. Passengers' active participation will lead to deeper feelings, but if passengers feel discomfort when engaging with a certain facility, passengers will have a negative experience and attribute that experience to the airport, thereby negatively impacting the brand experience [43]. Therefore, airports are required to provide their passengers with excellent, holistic, and multifaceted travel experiences [44,45].

2.5. Passengers Satisfaction

"Customer satisfaction" is defined as a post-consumption, evaluative judgment concerning a product, service, or firm [46]. Customer satisfaction is determined by whether the goods or services purchased by the customer meet the customer's normal perceived expectations [47]. When the goods or services exceed the customer's expectations, the customers will be satisfied, and in the opposite case, they will be dissatisfied. In fact, airports usually adopted a reactive approach to customer service up until the 1980s [48]. Passenger satisfaction levels at airports can reflect the real level of airport services to a great extent. Following the changes made in air transport industry, the interest in passenger satisfaction has substantially increased [26,49]. When facility services, such as security screening process [50], meet passengers' expectations, they will feel satisfied. However, different service levels of facilities will result in different levels of passenger satisfaction. Therefore, airports must not only try their best to improve the service process as exemplified in the offering of comfortable facilities and services, but they must also attach great importance to meeting the expectations of passengers.

3. Hypothesis Development

As the number of facilities in airport terminals increases, the variety of services will bring different senses of engagement to passengers. On the one hand, comfortable facilities will attract passengers to actively participate in airport branding activities [51]. A good service quality makes passengers willing to share their attitudes and opinions on facilities and airports, thereby contributing to the building of airport brand, which also links airport facility service quality to brand engagement. On the other hand, when these facilities underperform, the engaged passengers may abandon the brand for another option when they have an alternative airport, for example, choosing Hongqiao International Airport instead of Pudong International Airport for departures from Shanghai, thus reducing discussion of the airport brand. To enhance and warrant brand engagement with passengers, airports must make intentional efforts, such by as improving the quality of their products or facilities [8,38]. Therefore, it is reasonable to assume that airport facility service quality has positive effects on the airport brand, especially for engagement. As a result, a stronger connection with the brand can be achieved. Consistent with the discussion, the following hypothesis is offered:

Hypothesis 1 (H1). *Facility service quality has a positive influence on airport brand engagement.*

Previous studies show that the service provided by a facility itself could affect customers' emotional experiences [52]. The airport brand experience is the result of a series of interactions that occur between the airport and passengers during facility encounters [38]. For airports, brand experience is commonly embedded in the process of contraction with the brand, in which passengers show their emotions, behaviors, and curiosity as based on their feelings when using these facilities. At the same time, they also attach these feelings

to the airport brand. Service quality in every contact enhances passengers' experiences of the brand. This discussion informs the following hypothesis:

Hypothesis 2 (H2). *Facility service quality has a positive influence on airport brand experience.*

There are different patterns of how consumers experience a brand. Some consumers develop a good experience quickly, while others need time to engage more with the brand before they develop a favorable perception of it, which may lead to a more positive brand experience [53]. Brand experience is evoked by a variety of stimuli which occur during customers' direct and indirect interactions with a brand [54]. Essentially, passengers' brand evaluations and consequent post-consumption attitudes, experiences, and moods are impacted by the brand interaction/processes. Therefore, active engagement ultimately leads to good brand experiences for consumers [55].

Hypothesis 3 (H3). *Airport brand engagement has a positive influence on airport brand experience.*

As hypotheses 1 and 3 indicate, direct associations have been established between facility service quality and brand engagement, as well as between brand engagement and brand experience. This suggests that brand engagement acts as a mediator for the influence of facility service quality on brand experience. The strength of the passenger–brand relationship is largely dependent on the passenger's engagement with the airport brand [28]. Generally speaking, different levels of facility service quality bring about different responses and engagement, and different degrees of engagement will also affect the passenger's brand experience [11]. Moreover, brand engagement can be viewed as a vehicle or mechanism that converts facility service quality into brand experience [53]. Based on these arguments, the following hypotheses is suggested:

Hypothesis 4 (H4). *The positive influence of facility service quality on airport brand experience is based partly on airport brand engagement.*

Service quality has always been recognized as a critical factor in consumers' minds, which is a pivotal antecedent of satisfaction [56]. When travelers arrive the airport, they evaluate the facility during service participation, leading to satisfaction or dissatisfaction [57,58]. If the service quality of the facilities performs poorly, in other words, if the facility does not meet the needs of the travelers, it will eventually make the travelers dissatisfied. Besides, previous scholars have analyzed the effects of different levels of service quality and choice items on passenger satisfaction and examined the determinants of passenger satisfaction with the airport and the nature of the relationship between satisfaction and service value [59,60]. Based on the literature reviewed, the service quality–satisfaction relationship has been emphasized. Therefore, we formulate the following hypothesis:

Hypothesis 5 (H5). *Facility service quality has a positive influence on passenger satisfaction.*

Passengers' engagement profoundly influences their satisfaction. Brand engagement induced by facilities commonly focuses on behavior; therefore, passengers' behavior towards the brand will demonstrate their attitudes, such as satisfaction or dissatisfaction [8]. Besides, passengers who actively participate in the brand can provide insights on how to better design strategies to continually improve satisfaction for them. When the actual experience exceeds consumers' expectations, this results in satisfaction (Oliver, 1980). Following this logic, passenger satisfaction can be described as the outcome when passengers' affective and cognitive evaluations of the airport brand performance exceed the expected brand performance. Therefore, satisfaction depends on assessments of the brand experience [61]. Besides, previous research has also empirically verified that brand experience exerts a positive influence on satisfaction [62]. We therefore hypothesize that:

Hypothesis 6 (H6). *Airport brand engagement has a positive influence on passenger satisfaction.*

Hypothesis 7 (H7). *Airport brand experience has a positive influence on passenger satisfaction.*

Hypotheses 1 and 6 suggest direct links between facility service quality and brand engagement, as well as between brand engagement and passenger satisfaction. Passenger-brand interaction, as an important way for airport to provide services, is not only an influential method for passengers to evaluate facility service quality, but also an important way for brands to provide satisfying facilities for passengers. In other words, both brand facility service quality and passenger satisfaction are achieved in a brand–passenger interaction [63]. Thus, we propose the following hypothesis:

Hypothesis 8 (H8). *The positive influence of facility service quality on passenger satisfaction is based partly on airport brand engagement.*

Scholars have generally investigated the two domains of indicators and their effects on passenger satisfaction, and they have found that there are direct passenger–airport interactions that determine the greater part of passenger satisfaction with an airport [64,65], while processing domain–passenger satisfaction relations are stronger than passenger relations with the non-processing domain [65]. Facilities related to airport processes are the most basic to the airport, and they are directly related to the functions of the airport. Non-processing facilities are those that passengers can access while waiting in or wandering through the airport although not all passengers will necessarily use them [66]. Therefore, we can assume that airport processing facilities are more likely to influence the airport brand because passengers will be more likely to associate these facilities with the airport brand. However, previous studies did not focus on the impact of processing and non-processing facilities on brand factors. To further focus on specific facility factors that contribute more to airport branding, this paper intends to explore their impact on brand engagement and brand experience. Therefore, we postulate the following multipart hypothesis:

Hypothesis 9a (H9a). *The facility service quality of the processing domain has a positive influence on airport brand engagement.*

Hypothesis 9b (H9b). *The facility service quality of the non-processing domain has a positive influence on airport brand engagement.*

Hypothesis 9c (H9c). *The relation between the facility service quality of the processing domain and airport brand engagement will be stronger than the relation between the facility service quality of the non-processing domain and airport brand engagement.*

Hypothesis 10a (H10a). *The facility service quality of the processing domain has a positive influence on airport brand experience.*

Hypothesis 10b (H10b). *The facility service quality of the non-processing domain has a positive influence on airport brand experience.*

Hypothesis 10c (H10c). *The relation between the facility service quality of the processing domain and airport brand experience will be stronger than the relation between the facility service quality of the non-processing domain and airport brand experience.*

Figure 1 represents the anticipated theoretical conceptual model, which will be further developed in the ensuing sections.
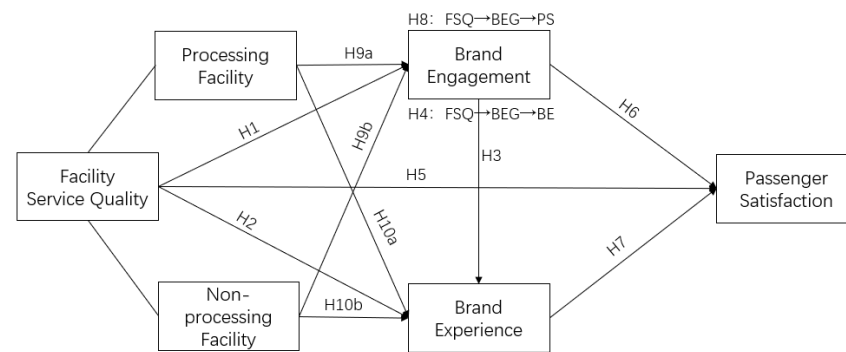
Figure 1. Hypothesized model.

4. Measures

4.1. Participants and Procedure

A multi-item measurement scale was used in this study to ensure the validity of the measures. The service quality items were measured with instruments from Thampan, Sinha [24], and Antwi, Fan [65]. The design of the brand engagement items was based on Obinna, Ellis [8]. The scale for brand experience was adapted from the research of Prentice, Wang [38]. Finally, the passenger satisfaction items were adopted from the research of Antwi, Fan [65]. Moreover, all variables were measured with a five-point Likert scale.

All measures of the constructs presented were derived from previous studies to ensure the validity of the content. As the data was collected in China, this study employed back-translation, which is a commonly used method of linguistic equivalence between two different languages [67]. The Chinese version was revised to ensure that the translation was more relevant to the airport environment and clearer to the respondents. Accordingly, the Chinese questionnaire was back-translated into English by two professional translators. Moreover, a pilot test with 33 respondents was conducted so as to evaluate the consistency of the questionnaire and determine whether the results manifested enough evidence of the validity and reliability of the instrument. According to the exploratory factor analysis and the respondents' feedback on the survey, the survey was refined in terms of structure, clarity, selection of words, and editorial corrections. The final version of these survey items is included in Appendix A.

4.2. Data Collection

Shanghai Pudong International Airport is one of the most important driving forces for the Chinese economy, with a great number of domestic and international passengers. At the same time, Pudong International Airport is one of the busiest airports in the world. On the one hand, Pudong International Airport could be seen as representative of the airports in mainland China and the world, based on the abovementioned elements, thus having sufficient research value. On the other hand, it already has a certain brand influence and is this an excellent study object for brand engagement and brand experience. Therefore, this study selected Shanghai Pudong International Airport for analysis. The survey was conducted in March 2021. To test the proposed hypotheses, the survey was distributed during face-to-face interactions with passengers at Shanghai Pudong International Airport over a two-week period. The sampling method used a random sampling approach, and each passenger had an equal chance of being selected. Passengers were informed of the purpose of the study, and the questionnaire was only given to those who were willing to participate. In addition, passengers were asked to complete the questionnaire based on their most recent experience of taking a flight from Pudong International Airport. We offered a certain monetary reward as show of gratitude for their support to encourage responses. A total of 255 questionnaires were distributed to passengers, and 218 completed replies were returned, making for a response rate of 85.5%. Then, a filtering process was performed to guarantee the quality of the replies. We removed 18 questionnaires with

incomplete data, 14 of which replied with exactly the same answers to all of the questions, thus resulting in 186 valid responses with a valid response rate of 85.3%. Table 1 details the characteristics of the respondents.

Table 1. Characteristics of respondents.

Measure	Item	Frequency	Percentage
Gender	Male	95	51.1%
	Female	91	48.9%
Age	<18	11	5.9%
	18–25	47	25.3%
	26–35	94	50.5%
	>35	34	18.3%
Level of education	High school or below	26	14.0%
	Junior college	45	24.2%
	Bachelor's degree	74	39.8%
	Master's degree or higher	41	22.0%
Purpose	For travel	74	39.8%
	For education	16	8.6%
	For business	80	43.0%
	Others	16	8.6%
Frequency	0–2 times per year	89	47.8%
	3–5 times per year	44	23.7%
	Over 5 times per year	53	28.5%
Type of flight	Domestic flights	149	80.1%
	International flights	37	19.9%

The questionnaire started by engaging participants to report socio-demographic information (e.g., gender, age, education, and purpose of travel) in order to refresh their memories of their airport experiences and to enable us to discern the authenticity of the questionnaire. Frequency analysis was performed using SPSS to check whether there were any missing values in the demographic data, such as age, gender, and educational level. The results of the mentioned analyses confirmed that the data were complete and within the acceptable range. As shown in Table 1, 48.9% were female and 51.1% were male. As for age, 5.9% were under 18 years old, while 25.3% were 18–25 years old, 50.5% were 26–35 years old, and 18.3% were over 35 years old. A total of 115 respondents had obtained an undergraduate degree or above. Besides, almost 43% of respondents' most recent trips by air were for business, while 39.8% were for travel, 8.6% were for education and other reasons, respectively. In addition, passengers who took flights less than 2 times per year accounted for 47.8%, while 23.7% took flights 3–5 times per year, and 28.5% took flights more than 5 times per year. Finally, most of the respondents (80.1%) took domestic flights for their recent experiences, and only 19.9% took international flights.

To eliminate potential, common biases in the method, two tests were performed in this study. Firstly, Harman's single factor method was adopted to examine the data, and the results indicate there was no common bias in the method, as the first construct caused 38.68% of the variance, which was lower than the acceptable 50% [68]. Secondly, we used the common latent factor method to test the data [69]. The standard regression weights were calculated through confirmatory factor analysis (CFA), and the common method factor of every item in the model was obtained through CFA again. The results show that the comparison of the regression weights did not indicate significant differences. In other words, there are no dominant factors in the results. In summary, the data in this study have no significant common biases due to the method.

5. Model Development

5.1. Measurement Model

The PLS Path Model (PLSPM) was proposed by Wold [70], and it consists of two main components: the first is the measurement model (also known as the "external model"), which describes the relationship between the explicit and implicit variables, and the second is the structural model (also known as the "internal model"), which describes the relationship between the implicit variables. The choice of the PLS-SEM method in this study was mainly influenced by its ability to simultaneously assess measurement quality and examine causal relationships between components without the need for large sample sizes and normally distributed data sets. Meanwhile, as PLS-SEM models can handle multiple dependent variables simultaneously and allow for measurement errors in both the dependent and independent variables, this paper applied SmartPLS 3.0 to process the data.

We assessed the measurement model to examine the reliability and validity of constructs. Reliability refers to the correctness or accuracy of a measurement instrument, representing the degree of consistency of the measurement. Validity, indicating the correctness, which consist of convergent validity and discriminant validity, is used to determine whether each measured variable converges, and whether the scale can distinguish between different items of the measured variable [71]; in other words, it must be able to reach the purpose of the measurement in order to be valid. As shown in Table 2, the Cronbach's α and composite reliability for each construct all exceed the value of 0.7, indicating acceptable internal reliability [72]. The results also reveal that the AVE values are within the recommended ranges, as each construct exceeded the value of 0.5, thus supporting the good reliability and validity of all of the constructs. Additionally, discriminant validity was evaluated as well. A recent method for assessing discriminant validity is the heterotrait–monotrait (HTMT) ratio of correlations [73]. The HTMT criterion is more conservative and is considered to be a better method for assessing discriminant validity. Table 3 depicts that the HTMT results are all lower than 0.85. $\mathrm{HTMT}_{0.85}$ is the most conservative criterion, as it achieves the lowest specificity rate of all the simulation conditions. Collectively, the model fit indices were acceptable.

Table 2. Confirmatory factor analysis results.

Constructs	Items	Loadings	Cronbach's α	Rho-α	Composite Reliability	AVE
Facility service quality (FSQ)	FSQ1	0.830	0.961	0.962	0.965	0.577
	FSQ2	0.747				
	FSQ3	0.828				
	FSQ4	0.763				
	FSQ5	0.705				
	FSQ6	0.747				
	FSQ7	0.721				
	FSQ8	0.727				
	FSQ9	0.824				
	FSQ10	0.723				
	FSQ11	0.763				
	FSQ12	0.707				
	FSQ13	0.758				
	FSQ14	0.709				
	FSQ15	0.719				
Brand Engagement (BEG)	BEG1	0.772	0.877	0.878	0.903	0.537
	BEG2	0.744				
	BEG3	0.866				
	BEG4	0.743				
	BEG5	0.813				
	BEG6	0.727				
	BEG7	0.783				
	BEG8	0.735				

Table 2. *Cont.*

Constructs	Items	Loadings	Cronbach's α	Rho-α	Composite Reliability	AVE
Brand Experience (BE)	BE1	0.745	0.875	0.879	0.909	0.669
	BE2	0.766				
	BE3	0.852				
	BE4	0.864				
	BE5	0.745				
Passenger Satisfaction(PS)	PS1	0.870	0.804	0.807	0.911	0.836
	PS2	0.893				

Table 3. HTMT result.

Constructs	PS	BE	BEG	FQ
PS	1.000			
BE	0.695	1.000		
BEG	0.618	0.802	1.000	
FQ	0.427	0.366	0.303	1.000

Note: FSQ = facility service quality; BEG = brand engagement; BE = brand experience; PS = passenger satisfaction.

5.2. Structural Model

In order to adjust the model quality, an analysis of the coefficients of determination (R^2) was performed. As shown in Figure 2, all constructs are between moderate and substantial ($R^2 > 0.5$), indicating that the model is adjusted and that it adequately explains the phenomenon studied. The collinearity was also checked using the VIF; the indicators of the model were between 1.589 and 3.228, within what Hair, Risher [74] suggest.
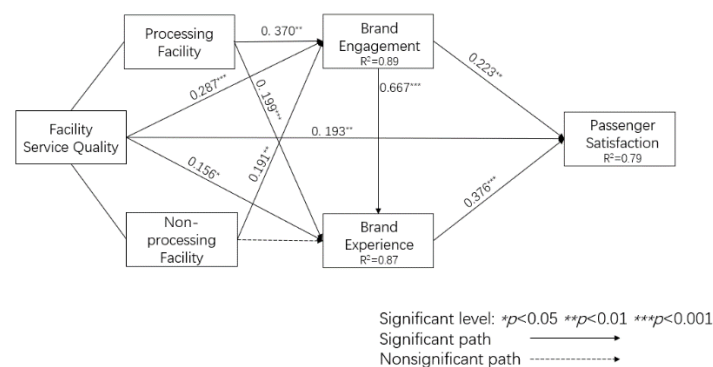

Significant level: *$p<0.05$ **$p<0.01$ ***$p<0.001$
Significant path
Nonsignificant path

Figure 2. The model of this study.

The result shows that the facility service quality of the airport has a significant effect on airport brand engagement ($β = 0.287$, $t = 4.644$, $p < 0.001$); thus, H1 is supported. The paths between facility service quality and brand experience, as well as between passenger satisfaction were significant ($β = 0.156$, $t = 2.573$, $p < 0.05$; $β = 0.193$, $t = 2.644$, $p < 0.01$, respectively), suggesting that facility service quality exhibits significantly positive effects on brand experience and passenger satisfaction, which prove H2 and H5. The results suggest that the higher the facility's quality is, (1) the higher the engagement level that the passengers have with the brand, (2) the better the passengers' experiences with the brand, and (3) the more satisfied the passengers are with the airport terminal. The result fills the gap regarding the way that airport facility service quality influences airport brand engagement and experience, as well as passenger satisfaction. Passenger–airport brand relationships are established. Moreover, brand engagement has a significant influence on brand experience ($β = 0.667$, $t = 12.608$, $p < 0.001$), which in turn impacts passenger satisfaction ($β = 0.376$, $t = 4.768$, $p < 0.001$), thereby validating H3 and H7. In addition, the

results show that brand engagement impacts passenger satisfaction significantly (β = 0.223, t = 2.990, *p* < 0.01); thus, H6 is supported.

The processing and non-processing facilities represent the basic efficiency-related services and the diverse comfort-based and commercial services of the airport, respectively. Further analysis at the path level indicated that the significant positive associations between processing facility service quality and brand engagement (β = 0.370, t = 2.780, *p* < 0.01), are stronger, compared to the association between non-processing facility service quality and brand engagement (β = 0.191, t = 2.126, *p* < 0.01); thus, H9a, H9b, and H9c are supported. The result shows that processing and non-processing facilities both have a positive effect on brand engagement. In addition, the direct impact of processing facility service quality on brand experience is statistically significant (β = 0.199, t = 3.638, *p* < 0.001). Since the impact of non-processing facilities on brand experience is not statistically significant (β = 0.074, *p* > 0.05), we cannot make a judgment on the significance of H10c with it; thus, only H10a is supported.

5.3. Mediating Effect Analysis

In the next step, we conducted mediation analysis to examine the indirect effects of airport facility service quality on passenger satisfaction and brand experience via brand engagement. The standardized indirect effect of facility service quality–brand engagement–brand experience relation is significant, as is the facility service quality–brand engagement–passenger satisfaction relation (see Table 4). Path-level analysis showed that the mediating effect for facility service quality–brand engagement–brand experience relation is strong, as is the relation between facility service quality and passenger satisfaction.

Table 4. Mediation analysis with bootstrap.

Indirect Pathways Tested	Biased-Corrected Bootstrapped Estimates for the Indirect Effects			
	95% CI		Standardized	
	Lower	Upper	Indirect Effect	SE
FSQ→BEG→BE	0.119	0.283	0.190 ***	0.042
FSQ→BEG→PS	0.117	0.283	0.189 ***	0.042

Note: FSQ = facility service quality; BEG = brand engagement; BE = brand experience; PS = passenger satisfaction; *** = *p* < 0.001.

The indirect effects are significantly different from zero (i.e., the mediating effects are significant) when zero is not in the confidence intervals. According to Table 4, bias-corrected, 95% confidence intervals were computed, and zero was not contained in these intervals. Such results further confirm our finding that brand engagement mediates the relationships of FSQ→BE and FSQ→PS under different levels of facility service quality (β = 0.190, *p* < 0.001; β = 0.189, *p* < 0.001, respectively). Therefore, brand engagement partially mediates the relationship between brand experience and facility service quality, as well as the relationship between passenger satisfaction and facility service quality; thus, H4 and H8 are supported.

In summary, the analysis results are shown in Table 5.

Table 5. Analysis results.

Hypothesis	β	t	*p*
H1. *Facility service quality has a positive influence on airport brand engagement.*	0.287	4.644	<0.001
H2. *Facility service quality has a positive influence on airport brand experience.*	0.156	2.573	<0.05
H3. *Airport brand engagement has a positive influence on airport brand experience.*	0.667	12.608	<0.001
H4. *The positive influence of facility service quality on airport brand experience is based partly on airport brand engagement.*	0.190	4.480	<0.001
H5. *Facility service quality has a positive influence on passenger satisfaction.*	0.193	2.644	<0.01

Table 5. *Cont.*

Hypothesis	β	t	p
H6. *Airport brand engagement has a positive influence on passenger satisfaction.*	0.223	2.990	<0.01
H7. *Airport brand experience has a positive influence on passenger satisfaction.*	0.376	4.768	<0.001
H8. *The positive influence of facility service quality on passenger satisfaction is based partly on airport brand engagement.*	0.189	4.448	<0.001
H9a. *The facility service quality of the processing domain has a positive influence on airport brand engagement.*	0.370	2.780	<0.01
H9b. *The facility service quality of the non-processing domain has a positive influence on airport brand engagement.*	0.191	2.126	<0.01
H9c. *The relation between the facility service quality of the processing domain and airport brand engagement will be stronger than the relation between the facility service quality of the non-processing domain and airport brand engagement.*	supported		
H10a. *The facility service quality of the processing domain has a positive influence on airport brand experience.*	0.199	3.638	<0.001
H10b. *The facility service quality of the non-processing domain has a positive influence on airport brand experience.*	0.074	\	>0.05
H10c. *The relation between the facility service quality of the processing domain and airport brand experience will be stronger than the relation between the facility service quality of the non-processing domain and airport brand experience.*	\		

5.4. Importance–Performance Map Analysis

In order to identify relevant and even more specific items for enhancing the performance of the brand engagement of the airport, we also conducted an importance–performance map analysis (IPMA) on the indicator level. Conclusions can be drawn on two dimensions (i.e., both importance and performance), which are particularly important in order to prioritize managerial actions. Consequently, it is preferable to primarily focus on improving the performance of facility service quality, which exhibits a relatively large importance regarding the explanation of brand engagement, but which also has a low level of performance [75–78]. As shown in Figure 3, we found that indicator FSQ1 ("Check-in process was efficient and/or easy for me") has a relatively high importance when focusing on the construct FSQ, while the performance of it remains to be improved. Hence, performance improvements could focus on increasing the number of check-in counters or optimizing the check-in process to provide passengers with the service they need. As a direct consequence, the increase of the performance of construct FSQ entails an improvement of target construct BEG. Similarly, other indicators (e.g., "Flight information was easily accessible" and "Immigration clearance process was efficient and/or easy for me") may gain particular attention regarding improving the BEG.
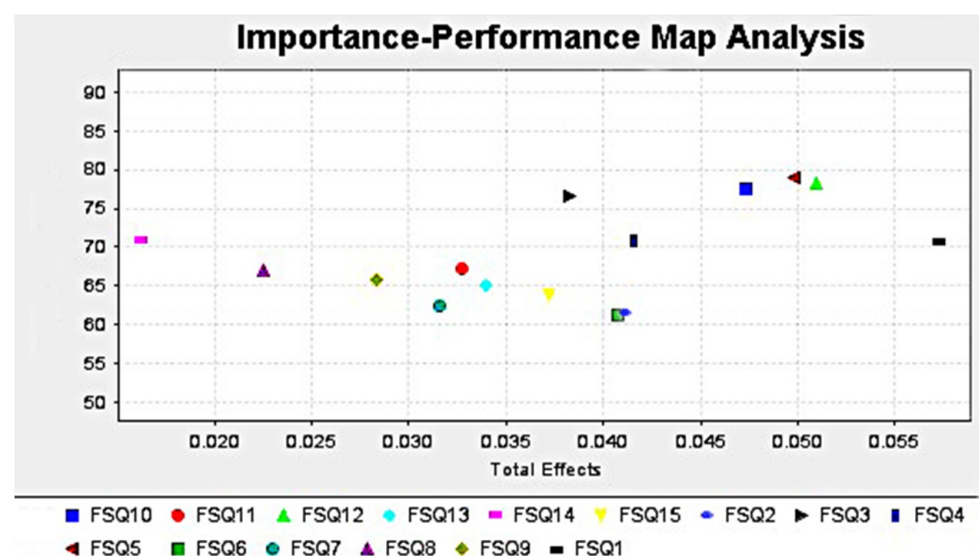

Figure 3. IPMA of brand engagement.

6. Conclusions

This study examines how facility service quality influences brand experience and satisfaction with a focus on the airport terminal, considering the mediating role of brand engagement. Besides, the mediating effects of brand engagement on the relationship between facility service quality, brand experience, and passenger satisfaction are also empirically examined with a random sample composed of passengers from Pudong International Airport in China. Details of these findings are as follows:

First, the study shows that the facility service quality of an international airport has a significant effect on brand engagement and brand experience. This finding provides evidence to support the arguments that the higher the service quality is, the more actively passengers engage with the brand [8] and the better their experience [79]. On the one hand, passengers hold different opinions on facility service quality, which leads to content engagement, advocacy, co-creation, or negative engagement with the airport, which is consistent with previous research [53]. On the other hand, high-quality facilities can lead to a better brand experience for passengers, behaviorally or emotionally. Prentice et al. [38] have also found that the service quality of facilities has a strong effect on brand engagement and experience in the airport industry, which is consistent with our findings. Moreover, brand engagement has significantly positive effects on passengers' brand experience. In particular, engagement contributes to passengers' emotional connection with the airport, which subsequently leads to improvements in their experience [58], causing a strong impression for them.

The results indicate that, no matter the facility service quality or brand engagement and experience, it will affect passenger satisfaction with the airport. This finding is consistent with that in Obinna, Ellis [8], Marliawati and Cahyaningdyah [45], and Ali, Kim [52]. Such consistent findings indicate that passengers' brand engagement with facilities actively improves brand experience, both of which are critical to achieving their emotional satisfaction. Meanwhile, this study proposes that the brand engagement that is assessed by passengers plays a mediating role in the chain relationship of the facility service quality of the airport and brand experience. This proposition is based on Prentice, Wang [38] contention that customer-based factors are more reflective of customers' volition to engage with a brand. This finding also confirms that, by engaging with a brand, passengers could deepen their understandings of airport facilities, which will greatly promote their experiences and satisfaction levels [10,80].

Interestingly, non-processing facilities have no significant effects on brand experience. Compared to other mechanisms that are affected by non-processing facilities, the strength of the service quality of the non-processing facilities on brand engagement and experience is weaker. Antwi et al. [65] have found that non-processing facilities statistically affect passengers' affective images and passengers' satisfaction with airports. The possible explanation is that passengers will not attach airports' non-processing facilities to airport brands. For example, they may think that stores or restaurants represent their own brand, instead of belonging to the airport's brand. In fact, passengers prefer the airport's processing facilities to exhibit a higher facility service quality since the basic function of the airport is transportation. This finding confirms that fundamental services are critical in engaging customers and improving customer satisfaction [5].

7. Implication

7.1. Theoretical Implications

This study has implications for the theoretical literature on brand development strategies because we have developed a detailed model to explore the impact of facility service quality on brand engagement and experience in the context of the airport industry, integrating existing findings across different research. The empirical analysis provides insights on showing that the direct effect of facility service quality on airport brand equity is significant. This finding is interesting and relevant because previous research found that the direct effect of facility service quality on brand equity is significant in other service contexts,

such as catering services and hospitality management. Lu, Gursoy [81] demonstrated that service quality plays an important role in authenticity in ethnic restaurants' brand equity. The current study empirically verifies facility service quality as a mechanism to improve brand equity in the context of an airport, thereby filling the literature gap.

Another key theoretical implication of this research is that facility service quality in processing domains exhibits stronger associations with brand equity than non-processing domains. This finding is congruent with that of Antwi, Fan [65]. In addition to expanding the conceptualization of airport facility service quality, the results of this study also suggest an important theoretical purpose in defining the nature of facility service quality (of the processing domain)–brand equity relationship (the reasons that passengers experiencing higher processing facility service performance may lead to more positive brand engagement). The possible explanation is that passenger experience of airport processing facilities may be more of a core part of passengers' perceptions of airport brand performance.

Although there are a number of factors that influence brand engagement, little attention is paid to examine the most important factor that affects airport brand engagement to improve engagement strategies. The present study fills the gap by using IPMA to identify the quality items that best associate the brand engagement with airport facility and thereby improve consumers' brand evaluations. As emphasized earlier, the check-in process is more important than other airport facility indicators in determining brand engagement. Given the multi-item nature of facility service quality, IPMA is a useful way to provide an effective means of identifying the importance and performance items for positioning brand engagement and measuring weights that indicate how certain service quality items distinctively influence the brand.

7.2. Implications for Practice

This study provides several managerial implications for practice, as follow: First, this study provides insights into facility service quality and brand equity research. From the customers' perspective, the firm should improve the quality of their facilities and enhance facility management in order to be competitive. Meanwhile, interaction with facilities can increase customer engagement with an airport's brand and help to enhance the passenger experience. Particularly in the airport industry, the facility services provided by the airport are complex, with multiple stakeholders (e.g., airlines, travel agencies), but not unpredictable. Therefore, airport managers should pay more attention to facilities, particularly attending to the processing facilities of the airport through the proper handling of facility–passenger interaction, as well as the physical environment where these interactions take place. Furthermore, value-added, non-processing facilities, such as shops, restaurants, and access modes, should be properly coordinated. How the airport responds to facility services will directly affect passengers' choices when selecting airport brands since they prefer ones with which they have had positive experience. This finding reminds airport managers to reassess the dominant role of facility service quality and to take the research context into account.

Second, this article also shows that, for airport facilities, facility service quality has a positive effect on customer engagement with the brand, which in turn positively influences brand experience and satisfaction. This implies that increasing the engagement between passengers and airport brands is essential if brands want to turn the service quality of their facilities into brand equity for the airport industry, as well as enhancing brand experience and satisfaction. Engagement is now expressed more in the form of comments or posted content. If the number of posts with positive or negative reviews is large, companies need to create specific strategies to manage these reviews. Managers should realize the benefits of social media engagement and take action to actively manage the reviews instead of ignoring them. For example, companies should actively respond to posts that receive a lot of engagement from users, as the content in such posts may represent something of interest to many users and may have a profound impact on the users involved.

Third, this study provides important implications for the management of service quality in airport facilities, regarding the facilities procurement, operational management, and resource allocation for airport terminals to enhance airport service capabilities and enable intelligent operations and maintenance. As a result of the above analyses, it can be determined that, for services of high importance, targeted improvements are required to enhance and manage their quality. The airport should strive to provide a comfortable environment, complete facilities, and easily accessible information, as well as accurate and reliable services for passenger check-in, security, and boarding. The processes of check-in and security clearance have been hot research topics for experts and academics. In addition to increasing the number of check-in counters and security checkpoints, it is also important to consider how to improve the user-friendly and comfortable experience. This provides a basis for future research on sustainable improvement strategies for airport facility service quality.

7.3. Limitations and Future Research

Although this study provides some important insights for both theory and practice, it still has limitations that can be improved in future research. First, an obvious limitation of this study involves the sample used. Shanghai Pudong International Airport was selected for analysis, and the evaluation model and sample data have certain limitations and specificity. Therefore, it is important to be cautious in extending these results to a broader population. Further studies could consider using larger samples from several airports in several different countries. Meanwhile, the important indicators affecting brand equity and satisfaction that are not included in the model can be unearthed, such as facial recognition [82] and service robots [83]. Therefore, the model can be revised and improved continuously.

Second, this study explores the mediating mechanism by which facility service quality influences brand experience and passenger satisfaction from a brand engagement perspective and ignores other perspectives as well as other potential mechanisms. Future studies could further investigate other mediating mechanisms and moderating mechanisms as the impact of facility service quality on brand experience and satisfaction is complex, thus requiring new logics and theory.

Third, the survey methodology using self-reported data is potentially biased. Some participants may not be able to provide accurate evaluations of airport facility services and brand perceptions. Additionally, the data used in the present study are cross-sectional, while brand experience and passenger satisfaction in the airport industry are dynamic, and thus the influence of the service quality of airport facilities on brand experience and satisfaction is also dynamic, which should attract scholars' attention. Future research should use objective, quantitative data to measure the service quality more realistically and explore the effects dynamically.

Appendix A

Table A1. Facility service quality.

Departure Processing Facilities	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
FSQ1. Check-in process was efficient and/or easy for me.	1	2	3	4	5
FSQ2. The number of self-check-in facilities was adequate.	1	2	3	4	5
FSQ3. I felt secure after a thorough screening.	1	2	3	4	5
FSQ4. X-ray screening and security-check facilities were user-friendly and comfortable.	1	2	3	4	5
FSQ5. The immigration clearance process was efficient and/or easy for me.	1	2	3	4	5
FSQ6. the boarding procedure was efficient and/or easy for me.	1	2	3	4	5
FSQ7. The internal environment (cleanliness, lighting, air conditioning, etc.) of the aerobridge corridor was comfortable.	1	2	3	4	5
FSQ8. The use of the aerobridge made for an easier and safer connection between airport terminal and aircraft.	1	2	3	4	5
Departure Non-Processing Faculties					
FSQ9. The sanitary condition of restrooms is good.	1	2	3	4	5
FSQ10. The waiting area/lounge is comfortable for waiting.	1	2	3	4	5
FSQ11. Baggage trolleys are available and conveniently located	1	2	3	4	5
FSQ12. Internet or Wi-Fi is available.	1	2	3	4	5
FSQ13. Flight information was easily accessible.	1	2	3	4	5
FSQ14. The walking distance inside the terminal is short.	1	2	3	4	5
FSQ15. The terminal has a variety of shops and consumer products (i.e., clothes, food, and beverages).	1	2	3	4	5

Table A2. Brand Engagement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
BEG1. I have posted pictures/graphics related to this airport.	1	2	3	4	5
BEG2. I have shared/commented on the airport related posts.	1	2	3	4	5
BEG3. I have said positive things about this airport and its facilities to others.	1	2	3	4	5
BEG4. I will encourage friends and relatives to use some facilities (restaurant, café, shops, etc.) in this airport in the future.	1	2	3	4	5
BEG5. I will make constructive suggestions to the airport about how to improve its facilities.	1	2	3	4	5
BEG6. I will let the airport know of ways that can better serve my needs.	1	2	3	4	5
BEG7. I would contact the airport if its facilities were continually below expectations.	1	2	3	4	5
BEG8. I would post negative comments if the airport's facilities continued to be below expectations.	1	2	3	4	5

Table A3. Brand Experience.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
BE1. I find the facilities interesting in a sensory way.	1	2	3	4	5
BE2. I engage in physical actions and behaviors when I use its facilities.	1	2	3	4	5
BE3. This airport results in bodily experiences.	1	2	3	4	5
BE4. I engage in a lot of thinking when I encounter this airport.	1	2	3	4	5
BE5. This airport brand stimulates my curiosity.	1	2	3	4	5

Table A4. Passenger Satisfaction.

	Not Very Satisfied	Not Satisfied	Neutral	Satisfied	Very Satisfied
PS1. Overall, with regard to the facilities of this airport, I am …	1	2	3	4	5
PS2. Overall, with regard to the level of service provided by this airport, I am...	1	2	3	4	5

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