

## Effects of Airport Servicescape on Passengers' Satisfaction: A Hierarchical Approach and Importance-Performance Analysis

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**Abstract** By the threat of other countries' new or renovated airports, Taiwan Taoyuan International Airport endeavor to improve its service quality. Satisfaction has been discussed to be one of the crucial factors that influence whether passenger will repurchase on specific product. We focus on the physical surroundings and its further impact on the satisfaction. This research proposes a 2-order model and explores the relationship between servicescape and satisfaction through structural equation model (SEM). Furthermore, combining Importance-Performance Analysis (IPA) this research finds out some key items needed to be improved with high priority. Specifically, the results show that convenience of passenger traffic flow system should be improved first. Lastly, we propose some implications and suggestions for further research.

**Key Words:** *Servicescape, Satisfaction, Structural Equation Model, Airport, Hierarchical, Importance-Performance Analysis*

### 1. INTRODUCTION

Due to the fast developing technology, we can get to other cities faster and much more delightedly as well during the flight, and therefore need for air-transportation has increased rapidly in pursuit of time-saving and satisfaction simultaneously. However, when passengers take a flight or arrive from other airport, the terminal is the first place they see and use. How they perceive will in turn affect the very first image of this country. Thus, it is important to understand how the physical surrounding of the airport affects passengers' perception.

Taiwan Taoyuan International Airport was first constructed in 1979. It was the most novel airport among Asia at that time, boasting its service, such as rigid dealer control, fluent passenger flow, and efficient customer service, etc., leading airport from neighboring countries, (e.g.: Singapore Changi Airport) to emulate it. However, terminals fell into disrepair and are no longer competent, while other Asian airports had gradually renovated. As a result of that, Taiwan Taoyuan International airport has slipped in the global service assessment, yet newly developing airport like Incheon International Airport won the Airport Service Quality (ASQ) 2011 Awards. Recently Civil Aeronautics Administration of Taiwan has attempted to renovate Taiwan Taoyuan International Airport. They expected to provide customers better service both in hardware and software and further make customers more satisfied with the environment of the airport.

Prior researches about service quality of air transportation were largely focus on the service quality of airlines (Westwood, Pritchard, and Morgan, 2000; Chang and Yeh, 2002; Lu

and Ling, 2008). Only few researches focus on how the design or the quality of physical environment influences the passengers' perception. However, a series of research show that the facilities, equality, air, brightness, and music may influence customers' perceptions (Bitner, 1992; Baker, Grewal, and Parasuraman, 1994; Brady and Cronin Jr, 2001; Milfont and Duckitt, 2004). In view of this plus airport is the gateway of Taiwan to foreigners, we should attend to elevate the competence of international airport. In particular, we find out what (how) will (it) affect customer satisfaction. Furthermore, different from earlier research lacking considerations of servicescape, referring to Bitner (1992) as "the manmade, physical surroundings as opposed to the natural or social environment", we take that into account. Thus, we focus on the effects of airport servicescape (e.g. architecture, facilities, signs, and so on) on the passengers' satisfaction in this research.

Lastly, all managers and executives want to use their resources in an effective way. They would like to know what factors matter to passengers yet with low satisfaction. Thereby we combine the Importance-Performance Analysis (IPA) to find out what is important yet poorly satisfied to customer, aiming to dig out more about the customer insights and to provide a better practical use. The following four chapters will present the previous literature, method of analysis, analysis results, and conclusion respectively.

## **2. LITERATURE REVIEWS**

### **2.1 Service Satisfaction and Airport Service Quality**

Satisfaction is consisted of expectation and disconfirmation (Oliver, 1980). In particular, expectation can be seen as adaptation level affected by factors mentioned in Helson's (1959) discussion of adaptation phenomena; positive disconfirmation occurs when the product exceed our expectations, and vice versa. Churchill Jr. and Surprenant (1982) take satisfaction as a crucial factor to post-purchase. However, they found that "for durable products performance differences are the major determinant of satisfaction, and conversely that the disconfirmation of initial expectations has little impact." Here, durable goods are considered to be goods that are expected to last for a long time and yields utility over time rather than once and for all. This is also one of the natures of service in general.

Parasuraman, Zeithaml, and Berry (1985) suggest that the perceived quality of service lies in the difference between expected service and perceived service. Parasuraman, Zeithaml, and Berry (1988) further propose five dimensions of service, including Tangibles, Reliability, Responsiveness, Assurance, and Empathy. Buzzell and Gale (1987) found that the relationship between quality and profitability exist both in manufacturing and service industry. Voss, Parasuraman, and Grewal (1988) found the relationship between service quality and customer satisfaction.

The research about passenger needs and their perception of service quality have been developed during the past few decades. A new generation of terminal assessment models incorporating issues such as comfort, convenience, and ambience in the evaluation models has emerged (Zidarova and Zografos 2011). The prior research focuses on the evaluation of performance of airport passenger terminals reveals that compactness, delay, service reliability, service reasonableness, cost, and comfort & diversion are the factors of performance from passengers' point of view (Lemer 1992). Comfort and diversion, which related to the tangible facilities or equipment, is composed of "crowding", "sound levels, clarity, and noise", "temperature, humidity levels", "visual character", "choice of things to do", and "influence on sociability". Rhoades, Waguespack Jr, and Young (1991) confirm the importance of the key factors relating to airport quality identified from previous research. The first factor is related

to the passenger service: food and beverage, rest-room facilities, retail and duty free, and special services. The second factor is related to the issues of airport access parking, rental car services, and ground transportation. The third factor is related to areas of airline-airport interface: gate boarding areas, baggage claim facilities, and information display. The final factor contains a single item: inter-terminal transportation. Manataki and Zografos (2009) proposed a hierarchical model to analysis the airport performance and structured into two hierarchical levels. The first level of the hierarchy reflects the airport terminal system decomposition into a set of Airport Functional Areas, and the second level reflects the Airport Functional Areas' decomposition into Service Facilities of the airport terminal. Yeh and Kuo (2003) narrow the field of study down to international airport. By consulting related professionals in Taiwan, they found out six constructs (Comfort, Processing Time, Convenience, Courtesy of Staff, Information Visibility, and Security) to measure service performance.

Research reveals that evaluating the service quality in may not accurately reflect the concept of service quality in some way (Dabholkar et al. 1996). It is possible that customers could focus on certain aspects of the services in their mind while responding to these questions. Service quality is conceptualized as a formative construct which means the dimensions of service quality cause the overall service quality perception. Prior research in service quality shows that high inter-correlations among indicators across dimensions, and several studies have found only one factor (Dabholkar et al. 1996). Thus, researchers proposed a hierarchical conceptualization of service quality, which suggest that service quality perceptions are not only multidimensional but multilevel (Dabholkar et al. 1996; Woo and Ennew 2005; Jen, Tu, and Lu, 2011). There are two advantages for modeling in this way. First, because the higher-order factor extracts the underlying commonality among the dimensions, the hierarchical factor structure can capture dimensions important to the passengers (Dabholkar et al. 1996). Secondly, the hierarchical structure recognizes that the evaluation of service quality may be more complex than previously conceptualized (Dagger et al. 2007).

## **2.2 Servicescape**

Abundant researches of (service) environmental factors have been proposed. Specifically, they include the subject of retailing store choices, quality inferences, marketing tools, Internet shopping preference, buying behaviors, and psychology. Among them, variant terms are used, for example "Economic Environment", "Store Environment", "Servicescape", "Aesthetics", "Atmospherics" (see various: Arnold, Handelman, and Tigert, 1996; Baker, Grewal, and Parasuraman, 1994; Bitner, 1992; Mathwick, Malhotra, and Rigdon, 2001; Kotler, 1973; Turley and Milliman, 2000; and Weinrach, 2000). In our study, we employ the term "servicescape" proposed by Bitner (1992), and take physical surroundings (Bitner 1992) and social factor (Baker, Grewal, and Parasuraman, 1994) into account.

Bitner (1992) regard servicescape as the manmade, physical surroundings as opposed to the natural or social environment. She contends that there are three main composite dimensions of servicescape: ambient conditions, spatial layout and functionality, and signs, symbols, and artifacts. Specifically, ambient conditions are refer to as background characteristics that can affect our five senses, such as temperature, air quality, noise, etc. Spatial layout and functionality are referring to as how things are put together and capabilities that they can facilitate performance and the accomplishment of goals, such as equipment, layout, furnishings, etc. Signs, symbols, and artifacts are refer to as items that implicitly or explicitly communicate about the place to users, such as signage, style of décor, personal artifacts, etc. Baker, Grewal, and Parasuraman (1994) contend that we should consider the

social factor, which related to the person within the service.

Various research about service environment and customers' emotions attitudes, and intentions have been conducted after the concepts "servicescape" was proposed. In the realm of Chinese casino, Lio and Rody (2009) find out that aesthetic factor (i.e.: Signs, symbols, and artifacts dimension) have a significant relevance toward customers' perception of the overall servicescape quality. Robert (2009) in the leisure cruise service industry discovers that not only the ambient condition but layout, décor, size facilities and social factors as well, influence cruisers overall experience. In the realm of coach transport, Jen, Tung, and Lu (2005) confirm that servicescape is the main factor influencing the overall service quality and can further influence customers' intention. Athanasopoulou (2008) in the athletic service industry points out that decent servicescape can improve relationship quality, for example customer satisfaction and loyalty. However, in the literature of air transportation, little about overall environment is taken into account, and therefore we combine this into our study.

### 3. METHOD

#### 3.1 Research Model and Hypotheses

This research is aimed to examine the effects of servicescape on passengers' satisfaction in the airport domain. After reviewing the previous literature we refer to concept of servicescape from Bitner (1992) and exploit the following constructs: ambient conditions, spatial layout and functionality, and signs, symbols, and artifacts. Our model refers to the model of Brady and Cronin Jr. (2001) suggesting that the primary dimension servicescape contain three subdimensions: ambient conditions (with 3 items), spatial layout and functionality (with 3 items) , and signs, symbols, and artifacts(with 3 items). Furthermore, owing to the mean score defect and the virtue of hierarchical factor structure, our model served servicescape as a higher-order factor, which reflects on the three dimensions. We use the evaluations of each item to form the perceptions on each if the three dimensions. Passengers may aggregate their evaluations of these three subdimensions to form their perceptions of servicescape; this perception may further influence satisfaction.

The surrounding environment can have a significant effect on the perceptions of consumers (Bitner, 1992; Crane and Clarke, 1988). Thus, we suggest that ambient condition, spatial layout and functionality, and signs, symbols, and artifacts are the factors as underlying dimensions of the service environment. Along with this, we further propose the research framework and hypotheses, which are shown in Figure 1.

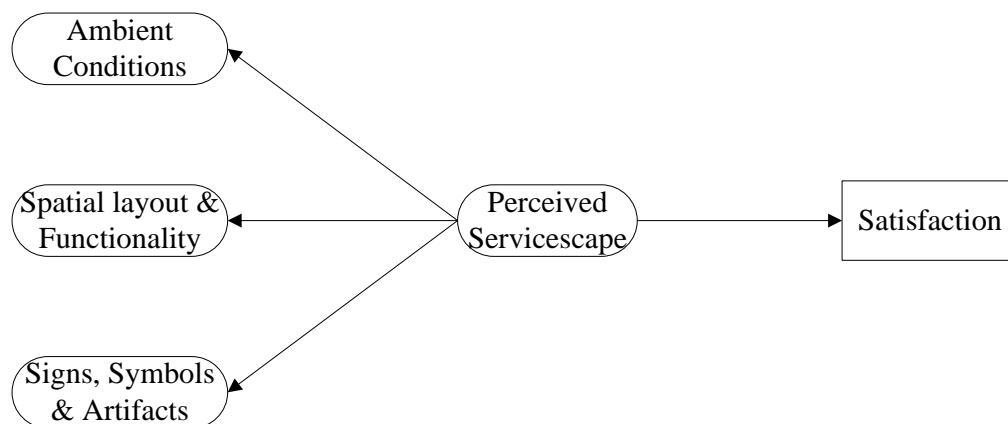


Figure 1 Research model

H<sub>1</sub> : Perceived servicescape is a higher order construct that represents (a) ambient conditions, (b) spatial layout and functionality, (c) signs, symbols, and artifacts.

H<sub>2</sub> : Perceived servicescape, constructed as a second-order construct, positively influences the satisfaction.

### 3.2 Measurement

In the research model, we employed nine manifest variables as multiple indicators for three latent variables related to servicescape and one manifest variable as single indicator for satisfaction. Questionnaire is formulated to ask passengers' opinion about airport service's performance and importance. A Likert five-level scale is applied to all questions to allow respondents to rate each construct variable with 1 (5) meaning very poor (very good) in the performance part and least important (most important) in the importance part.

The concept of servicescape proposed by Bitner (1992) is composed of three main theoretical dimensions: 1. ambient conditions, 2. spatial layout and functionality, and 3. signs, symbols, and artifacts. We refer to the concept of servicescape and related questions to design the questionnaire. Regarding ambient conditions, which pertain to nonvisual aspects such as temperature and scent, we devised three questions: "V<sub>1</sub>: Hygiene within the terminal", "V<sub>2</sub>: Brightness within the building site", and "V<sub>3</sub>: Convenience of passenger traffic flow system". For spatial layout and functionality, which pertain to the layout or architecture of physical environment, we designed three questions: "V<sub>4</sub>: Convenience of the airport facilities (e.g., elevator, washroom, ATM, etc.)", "V<sub>5</sub>: Convenience of the restaurants and shops", and "V<sub>6</sub>: Preparedness of the fire control facilities". With regard to signs, symbols, and artifacts, we designed three questions: "V<sub>7</sub>: Clearness of flight information", "V<sub>8</sub>: Clearness of the facility signage", and "V<sub>9</sub>: Clearness of the passenger traffic flow signage".

As for the measurement of satisfaction, we use overall satisfaction to gauge it. Thus, the whole questionnaire contains ten questions (nine for servicescape and one for satisfaction), and each respondent needs to grade each question with respect to their performance and importance.

### 3.3 Importance Performance Analysis

Important Performance Analysis (IPA) was first brought up by Martilla and James (1986). By calculating the means of both performance and importance with respect to each question, we can get a number of means (e.g.: 9 performance means and 9 importance means in this research). We then plot them on the two dimensional coordinate with performance as horizontal axis and importance as vertical axis. Letting the mean of the 9 performance means and of the 9 importance means be the origin, we can divide each question into 4 quadrants:

Quadrant I (High Importance/Low Performance) is labeled Concentrate Here. The attributes that fall into this quadrant represent key areas that need to be improved with top priority.

Quadrant II (High Importance/High Performance) is labeled Keep up the good work. The attributes that fall into this quadrant are the strength and pillar of the organizations, and they should be the pride of the organizations.

Quadrant III (Low Importance/Low Performance) is labeled Low Priority. Any of the attributes that fall into this quadrant are not important and pose no threat to the organizations.

Quadrant IV (Low Importance/High Performance) is labeled as Possible Overkill. It denotes attributes that are overly emphasized by the organizations; therefore, organizations

should reflect on these attributes, instead of continuing to focus in this quadrant, they should allocate more resources to deal with attributes that reside in quadrant I.

### 3.4 Analysis

In this research, by employing structural equation modeling (SEM) together with importance-performance analysis (IPA), we divided our analysis into three steps. We first apply confirmatory factor analysis (CFA) to test whether the relationship between the observed variable and the underlying latent construct fit our hypothesized measurement model. Secondly, we test the proposed model (structural model) through path analysis to test our predictions and to explore the intensity between different constructs. Last, we plot our IPA grid to identify where we should concentrate and choose those with higher coefficients representing the item which influence customer satisfaction much more than others. As a result, this attribute represent resource-worthy service.

## 4. RESULTS

### 4.1 Sample and Reliability Analysis

A total of 252 questionnaires were distributed from October to December in 2012 in Taiwan Taoyuan International Airport. Specifically, we randomly recruit Chinese passengers who just alighted from the airplane or those who pick up passengers. We omitted the incomplete questionnaires. Totally 139 valid samples were received with rate of 55%. Among the poll, the proportion of male (64%) are greater than the proportion of female (36%), and over half (51%) of the respondents are in age under 30. For the part of income, most (41%) of the respondents earn 25,000-50,000 NTD per month. Tourism is the purpose of the respondents at large (61%). A majority (48%) of the passengers check Bachelor regarding their educational attainment. Tabular form is presented in table 1.

Table 1 Sample Demographics of the Poll

item		percentage	item		percentage
Sex	Male	64%	Age	Under 30	51%
	Female	36%		30-40	35%
Avg. Income	Under NTD 25,000	31%		40-50	13%
	NTD 25,000-50,000	41%		50-60	1%
	NTD 50,000-75,000	23%		60 above	0%
	NTD 75,000 above	5%	Education	Under Jr. High	0%
Purpose	Business	32%		Sr. High	2%
	Tourism	61%		Prof. School	11%
	Others	7%		Bachelor	48%
				Master	39%

In this study, we have chosen Cronbach's  $\alpha$  reliability coefficient for the reliability analysis. The reliability coefficients for ambient conditions, spatial layout and functionality, and signs, symbols, and artifacts, presented in the questionnaire were 0.688, 0.660 and 0.741 which were acceptable. Thus, this means all dimensions adopted in this research are acceptably reliable.

### 4.2 Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) is mainly used to validate whether the questions we ask successfully reflect the latent construct itself. In our study, there are 3 latent constructs in the model: ambient conditions, spatial layout and functionality, and signs, symbols, and artifacts. Each latent construct has three measurable variables. Results of measurement model fitness indices prior to adjustment are shown in Table 2. The quotient of Chi-square divided by degree of freedom is smaller than 3; AGFI exceeds 0.8 and; GFI exceeds 0.8 and RMR less than 0.08. According to the results, the indices show that acceptable fitness of measurement model. Furthermore, the correlation between 3 latent variables are shown in Table 3, 0.38 (ambient conditions and spatial layout & functionality), 0.24 (ambient conditions and signs, symbols, & artifacts), and 0.26 (spatial layout & functionality and signs, symbols, & artifacts) respectively.

Table 2 Result of measurement model fitness indices

	Chi-square	df	Chi-square/df	GFI	AGFI	RMR
Suggested value	-	-	< 3.000	> 0.800	> 0.800	< 0.080
	45.685	24	1.904	0.926	0.862	0.069

Table 3 Correlation between latent constructs

Constructs	ambient conditions	spatial layout & functionality	signs, symbols, & artifacts
ambient conditions	1.00	0.38	0.24
spatial layout & functionality	-	1.00	0.26
signs, symbols, & artifacts	-	-	1.00

In Table 3, there are the results of measurement model. The standardized factor loadings are statistically significant, and above the threshold of 0.5 except V<sub>7</sub>. The composite reliability estimates of three servicescape constructs are 0.716, 0.691, and 0.806 respectively. They exceed acceptable threshold 0.6 suggest by Hatcher (1998). Thus, this means all constructs adopted in this research are highly reliable. We further estimate the average variance extracted (AVE), which assesses the amount of variance that is capture by an underlying construct in relation to the amount of variance due to measurement error (Fornell and Lacker 1981). The estimations of AVE in Table 4 exceed 0.5. Fornell and Lacker (1981) suggests that the minimal acceptance level of variance extracted estimates should exceed 0.5. Therefore, in the consideration for all constructs, we can infer that our measurement model performs well.

Table 4 Analysis of measurement model

	Standardized factor loading	Composite reliability	Variance extracted estimates
Ambient conditions		0.716	0.555
V <sub>1</sub>	0.693*		
V <sub>2</sub>	0.548*		
V <sub>3</sub>	0.777*		
Spatial layout and functionality		0.691	0.534
V <sub>4</sub>	0.764*		
V <sub>5</sub>	0.669*		
V <sub>6</sub>	0.517*		
Signs, symbols, and artifacts		0.806	0.650
V <sub>7</sub>	0.432*		
V <sub>8</sub>	0.865*		
V <sub>9</sub>	0.931*		

Note: \*indicates *t*-test has reached the significance level of  $p < 0.001$

### 4.3 Path Analysis

This section shows path analysis of the research model. For the model fitness indices, the ratio of Chi-square/df is 1.849 and smaller than 3. With regard to other indices of the model, there are GFI = 0.914, AGFI = 0.853, and RMR = 0.073 respectively (see table 5). All indices reach the expected standard. Therefore, we can infer that the structural model performs fairly well.

Table 5 Result of structural model fitness indices

	Chi-square	df	Chi-square/df	GFI	AGFI	RMR
Suggested value	-	-	< 3.000	> 0.800	> 0.800	< 0.080
	59.161	32	1.849	0.914	0.853	0.073

The coefficients amongst the variables are shown in Figure 2. In general, signs for all path coefficients are consistent with our hypotheses in this study. All coefficients are with positive signs and statistically significant. The results show that ambient condition ( $t=3.996$ ,  $p$ -value $<0.001$ ), spatial layout ( $t=3.966$ ,  $p$ -value $<0.001$ ), and signs, symbols, and artifacts ( $t=3.565$ ,  $p$ -value $<0.001$ ) are the factors as underlying dimensions of the servicescape. And perceived servicescape has significant positive effect on the satisfaction ( $t=4.789$ ,  $p$ -value $<0.001$ ). Thus, the predictions in this research  $H_1$  and  $H_2$  were supported.

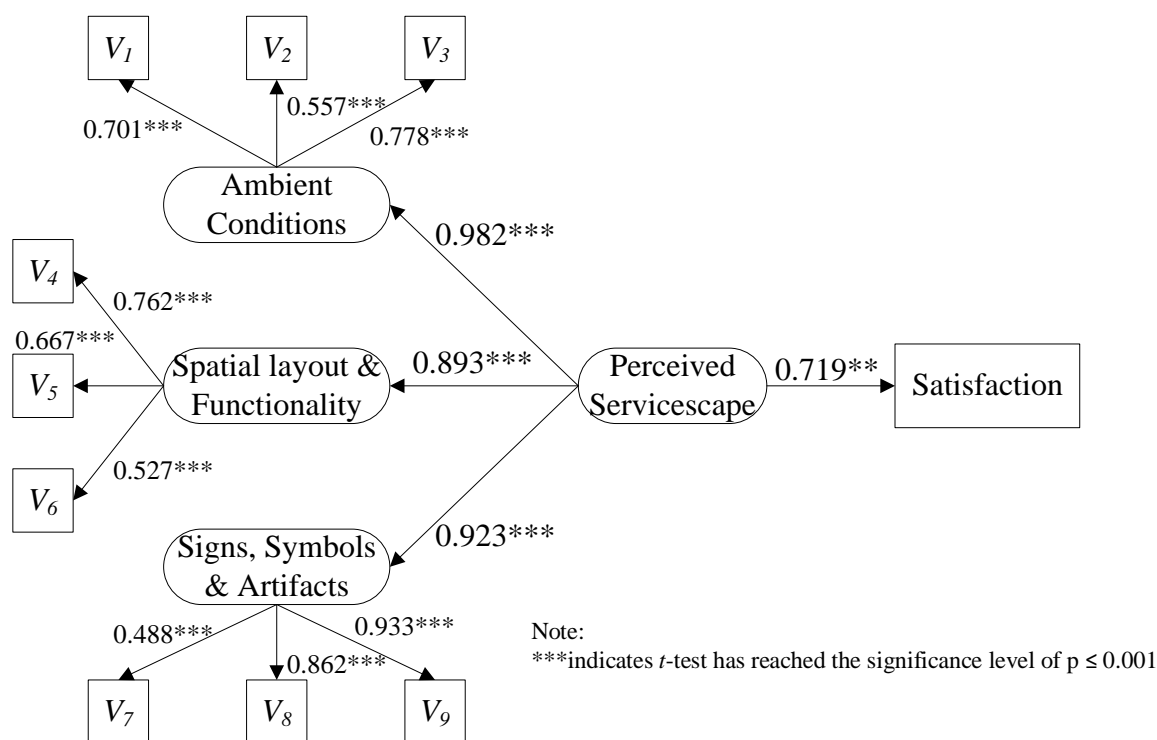


Figure 2 Results of standardized path coefficients

### 4.4 Importance-Performance Analysis

Just like the steps reviewed in section 3.3, in this section, we calculated the scores of performance, which indicate satisfaction, and importance of each measurement items and show them in the table 6. Further, we plot the Importance-Performance Analysis grid to obtain



the attributes that we should concentrate on. In figure 3, there are three attributes in the second quadrant:  $V_3$  Convenience of passenger traffic flow system,  $V_8$  Clearness of the facility signage, and  $V_9$  Clearness of the passenger traffic flow signage. It means that the passengers think these items are more important yet meanwhile less satisfied than others. Thus, airport administrator may think priority to improve them.

Table 6 performance and importance scores

	$V_1$	$V_2$	$V_3$	$V_4$	$V_5$	$V_6$	$V_7$	$V_8$	$V_9$	Average
Average Score of Performance	3.81	3.59	3.11	3.31	2.81	3.64	3.31	3.22	3.23	3.34
Average Score of Importance	4.65	4.41	4.36	4.27	4.00	4.52	4.48	4.42	4.15	4.36

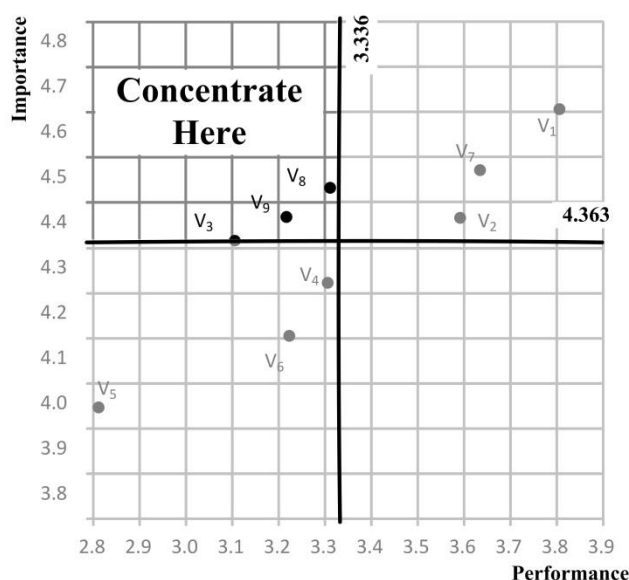


Figure 3 Importance-Performance Analysis grids

## 5. CONCLUSIONS AND DISCUSSIONS

This research focuses on how the surrounding environments of airport affect passengers' satisfaction and which item should be improved first to gain satisfaction effectively. We proposed a multilevel model to test our predations. The results of SEM show that ambient condition, spatial layout, and signs, symbols, and artifacts are the factors as underlying dimensions of the servicescape. Moreover, the ambient condition has large influence on the servicescape than other two dimensions; perceived servicescape has significant positive effect on the satisfaction. Furthermore, the results of Importance-Performance Analysis show that " $V_3$  Convenience of passenger traffic flow system", " $V_8$  Clearness of the facility signage", and " $V_9$  Clearness of the passenger traffic flow signage" are three items with relatively higher importance and relatively lower performance, it means these three items should be concentrated. Further, we combine on the results of SEM and IPA, we found that " $V_3$  Convenience of passenger traffic flow system" which belong to ambient condition has most influence on the servicescape and further affect satisfaction. Thus, with the limited budgets or resources, airport managers should improve this item first, and then improve the item " $V_8$

*Clearness of the facility signage*”, and “*V<sub>9</sub> Clearness of the passenger traffic flow signage*” which both belong to the signs, symbols, and artifacts. We suggest that the airport authority should take this issue seriously and improve them as fast as they can. Practical examples would be redesigning the passenger traffic flow system. In particular, make the contrast of the signage sharper, use the consistent color in different terminals, or show the direction more three-D or pop-out, because most of the passengers ask the instructor instead of watching the instructions, to name a few. Satisfaction will genuinely be improved if the authority can solve these problems.

This research aims to improve the surrounding environment quality of the Taiwan Taoyuan International Airport, and is surveyed in the arriving hall of terminal two only. Nevertheless, we should cover more survey area, for example both departure and arriving hall of terminal one (two) to avoid the state of being hurried of the respondents. And it is suggested that follow-up researches expand the sample range and collect some different country or culture samples to compare their servicescope perception.

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