

“An empirical analysis of synthesizing the effects of service quality, perceived value, corporate image and customer satisfaction on behavioral intentions in the transport industry: a case of Taiwan high-speed rail”

AUTHORS	Jonathan Hung-Che Wu Yu-Chiang Lin Fu-Sung Hsu
ARTICLE INFO	Jonathan Hung-Che Wu, Yu-Chiang Lin and Fu-Sung Hsu (2011). An empirical analysis of synthesizing the effects of service quality, perceived value, corporate image and customer satisfaction on behavioral intentions in the transport industry: a case of Taiwan high-speed rail. <i>Innovative Marketing</i> , 7(3)
RELEASED ON	Thursday, 27 October 2011
JOURNAL	"Innovative Marketing "
FOUNDER	LLC “Consulting Publishing Company “Business Perspectives”



NUMBER OF REFERENCES

0



NUMBER OF FIGURES

0



NUMBER OF TABLES

0

© The author(s) 2025. This publication is an open access article.

Jonathan Hung-Che Wu (Macau), Yu-Chiang Lin (Taiwan), Fu-Sung Hsu (Taiwan)

An empirical analysis of synthesizing the effects of service quality, perceived value, corporate image and customer satisfaction on behavioral intentions in the transport industry: a case of Taiwan high-speed rail

Abstract

The aim of this study is to fill the conceptual gap by identifying the dimensions of service quality and empirically examining the interrelationships among the service quality dimensions, service quality, perceived value, corporate image, customer satisfaction and behavioral intentions, in order to gain an improved understanding of passengers' behavioral intentions in the transport industry, specifically in the Taiwan high-speed rail sector. The dimensions of service quality are built on a basis of formative indicators, and also a multi-level hierarchical model is used as a framework to synthesize the effects of service quality, perceived value, corporate image and customer satisfaction on the behavioral intentions of passengers in the transport industry. The findings of this study are based on the multiple regression analysis of a convenience sample of 529 respondents. The finding reveals that there are three primary dimensions and 10 sub-dimensions of service quality in the transport industry.

Keywords: hierarchical model, service quality, perceived value, corporate image, customer satisfaction, behavioral intentions.

Introduction

In the past, the transportation that people in Taiwan use focuses only on vehicles, aircrafts and trains. Recently, that transportation has been gradually replaced by high-speed rail. Taiwan high-speed rail (THSR) is Taiwan's high-speed rail under construction with completion in 2005 (Nakagawa & Hatoko, 2007). THSR is a high-speed rail network running along the west coast of Taiwan. It is 336 km (208 mi), running from Taipei City to Kaohsiung City (World of Technology, 2008). Currently, there are eight THSR stations throughout Taiwan, specifically Taipei, Banciao, Taoyuan, Hsinchu, Taichung, Chiayi, Tainan and Kaohsiung-Zuoying. Those THSR stations spread all down the west coast of Taiwan, together with a large number of new bridges, tunnels, and viaducts, to avoid conflicts with other forms of transport as much as possible (Taiwan High Speed-Rail Consortium, 2007).

Because THSR has gradually replaced passengers' major mass transportation, the passenger quantity and the customer behavior of taking public transportation system will change (Hsiao & Yang, 2010). Moreover, the prices and speeds of aircraft and THSR are considered nearly equal. Since the high-speed railway service began, half of the air routes between Taipei City and the western cities of Taiwan have been discontinued (Chen, 2004). In Hsiao and Yang's (2010) study, THSR has been found to bring an impact for the domestic airline industry.

Currently, the franchised corporation operates trains at a top speed of 300 km/h when running from north to south in Taiwan. However, Chou and Kim (2009) note that passenger behavioral intentions have been considered to be a critical factor influencing the long-term operation, growth, and profits of service-oriented transportation systems. The service quality and customer satisfaction with THSR impact on passengers' behavioral intentions; the higher are the service quality and customer satisfaction, the higher are the behavioral intentions of customers (Liu & Liao, 2010). Several studies have established a link between perceived service quality and behavioral intentions, but using only value and customer satisfaction (Anderson & Sullivan, 1993; Gotlieb, Grewal, & Brown, 1994; Patterson & Spreng, 1997; Roest & Pieters, 1997). However, Chen (2008), Lin (2008) and Cledes, Gan and Zhang (2010) note that service quality, perceived value and customer satisfaction all seem to be good predictors of behavioral intentions but the interrelationships between them remain unclear in the transport industry. On the other hand, several studies (da Costa, Deliza, Rosenthal, Hedderley, & Frewer, 2000; Park, Robertson, & Wu, 2004) present that a favorable corporate image may contribute to customers' recommendations of the organization to others. In addition, several researchers suggest that the relationship between corporate image and behavioral intentions should be given more attention in the transport sector (Nadiri, Hussain, Ekiz, & Erdogan, 2008).

The primary and sub-dimensions of service quality have been identified for a variety of industries, for example, education, health care, accommodation, retailing, tourism and recreational sports, using hie-

rarchical modeling as a robust and testable framework (Dabholkar, Thorpe & Rentz, 1996; Ko & Pastore, 2005; Caro & García, 2007, 2008; Clemes, Gan & Kao, 2007; Dagger, Sweeney & Johnson, 2007; Clemes, Wu, Hu & Gan, 2009). However, despite the contribution THSR makes to the transport industry, Caro and García (2007) indicate that few studies have identified the primary and sub dimensions of transport service quality and linked those constructs to behavioral intentions using a multi-level hierarchical model. However, few studies have explored the relative importance of the primary and sub dimensions of service quality as perceived by passengers when they evaluate a THSR ride. Direct or moderating relationships between service quality, perceived value, customer satisfaction, and behavioral intentions are of key importance to the transport industry and studies on these constructs remain scarce (Park, Robertson, & Wu, 2006a). Also, little research has paid attention to identifying the least and most important service quality dimensions as perceived by passengers in the transport industry.

The contribution of this study is twofold. First, this study contributes to the marketing literature by providing an examination of several services marketing constructs. This is an important contribution because it provides a better understanding of passenger perceptions of service quality, value, corporate image, satisfaction and favorable future behavioral intentions. Second, this study conceptualizes and measures the passenger perceptions of transport service quality by adopting a multi-dimensional approach. This approach helps to overcome some of the weaknesses of traditional measurement methods (SERVQUAL and SERVPERF) and thus provides a more accurate approach to assessing service quality in the transport sector.

1. Concepts and operational definitions

1.1. Behavioral intentions. Fishbein and Ajzen (1975) define behavioral intentions as “a measure of the strength of one’s intention to perform a specific behavior” (p. 288). Hsiao and Yang (2010) note that understanding and analyzing passengers’ behavioral intentions on public transportation and further increasing of the public transportation use have become critical issues. The issue of behavioral intentions has been a focus in the hotel, health care, tourism and education sectors (Alexandris, Dimitriadis, & Markata, 2002; Clemes et al., 2007; Dagger et al., 2007). However, Pantouvakis and Lymperopoulos (2008) and Liu and Liao (2010) indicate that few empirical studies have paid attention to the behavioral intention construct in the transport industry, specifically in THSR.

1.2. Customer satisfaction. Hu, Kandampully and Juwaheer (2009) refer to customer satisfaction as “a cognitive or affective reaction that emerges in response to a single or prolonged set of service encounters” (p. 115). The concept of customer satisfaction has been reviewed in various ways. However, the underlying conceptualization is that satisfaction is a post-purchase evaluative judgment resulting in an overall feeling about a specific transaction (Fornell, 1992). Therefore, Wang, Chen and Zhao (2007) recommend that service organizations should pay more attention to the issue of customer satisfaction, striving to achieve higher levels of customer satisfaction.

1.3. Perceived value. Zeithaml (1988) defines perceived value as “the consumer’s overall assessment of the utility of a product or service based on perceptions of what is received and what is given” (p. 14). Several studies have considered perceived value as one of the most important marketing strategies in differentiation, and as a significant factor in maintaining corporate competitiveness (Treacy & Wiersema, 1993; Heskett et al., 1994; Ravald & Grönroos, 1996). However, Hsiao and Yang (2010) note that the issue of perceived value has not attracted much attention in the transport sector. Jen and Hu (2003) and Park et al. (2004) propose that few studies have explored and verified the perceived value construct from the passenger perspective.

1.4. Corporate image. Keller (1993) refers to corporate image as perceptions of an organization reflected in the associations held in the customer’s memory. According to Connor and Davidson (1997), an organization with a good corporate image is more likely to stand out in the marketplace because it can draw the attention of both repeat customers and trial users. Though customer satisfaction and loyalty have been examined in the transport context, corporate image tends to be ignored (Park et al., 2004). Such an omission, however, may cause problems of model mis-specification and weak predictive power (Bagozzi, 1980; Cronin & Taylor, 1992).

2. Conceptualization and measurement of service quality

Service quality has been studied for a long time in the field of service management (Caro & García, 2007). The concept of service quality is somewhat elusive and easy definitions are resisted (Quinn, 2007). Several researchers suggest that service quality is a multi-dimensional concept (Dabholkar et al., 1996; Brady & Cronin, 2001; Lu, Zhang, & Wang, 2009). However, a review of the transport service literature reveals that there are few existing scales that specifically measure service quality in the transport industry.

2.1. Formative constructs versus reflective constructs. Many researchers have suggested that service quality should be more appropriately conceptualized as a formative construct rather than a reflective construct when the direction of causality is from the dimensions to the construct (Dabholkar, Shepherd & Thorpe, 2000; Jarvis, MacKenzie & Podsakoff, 2003; Parasuraman, Zeithaml & Malhotra, 2005). In addition, Rossiter (2002), Jarvis et al. (2003) and Parasuraman et al. (2005) recommend that modeling service quality as a formative construct insofar as the dimensions is able to drive service quality perceptions. Under the formative measurement, Jarvis et al. (2003) indicate that the dimensions of the construct can give rise to, or cause, the overall construct through the formative measurement. In contrast, the dimensions are considered as reflective indicators of their higher order construct through the reflective measurement (Jarvis et al., 2003; Coltman, Devinney, Midgley & Venaik, 2008). In support of this measurement, Dagger et al. (2007) argue, for example, that it does not make sense to recommend that high levels of technical service quality are the result of people's perceptions of high overall service quality, as implied by the traditional, reflective measurement to modeling service quality and its dimensions, but rather that as technical service quality increases, overall service quality perceptions increase.

Dagger et al. (2007) note that modeling service quality as a formative construct through a multi-level and hierarchical model rather than in the more traditional reflective way stresses the influences of dimensions on the service quality construct. Alternatively, Diamantopoulos (2006) finds that modeling the service quality construct using the formative measurement contributes to a better specification for the construct. According to Jarvis et al. (2003), the existing literature recommends that few studies focus on formative indicator measurement models, even though they should. However, a multi-level and hierarchical model of service quality as a formative construct has not been developed in an applied framework to identify the primary and sub-dimensions of service quality, and to analyze the relationships between the primary and sub dimensions and service quality in the transport industry.

3. Research model and hypotheses development

This study uses a multi-level hierarchical structure as a framework to develop the conceptual model (see Figure 1 in the Appendix). This multi-level hierarchical model implies that THSR passengers form their perceptions of each of the 14 sub-dimensions and three pertaining primary dimensions: interaction

quality, physical environment quality and outcome quality, in order to form overall service quality perceptions. The THSR passenger perceptions of service quality influence perceived value, corporate image and customer satisfaction, and corporate image and customer satisfaction influence behavioral intentions. Moreover, perceived value moderates the relationship between service quality and customer satisfaction, and customer satisfaction is positively influenced by perceived value.

Chan, Fieft, Gable and Stark (2010) show that interaction quality focuses on the measurement of service quality delivered by the service provider. According to Caro and García (2008), both customers and managers consider that employee interaction with customers is highly important in determining the customer perception of service quality. Specifically, the literature identifies the following set of sub-dimensions that passengers evaluate as components of interaction quality: (1) attitude (Caro & García, 2007, 2008; Lu et al., 2009); (2) behavior (Brady & Cronin, 2001; Ko & Pastore, 2005); (3) expertise (Brady & Cronin, 2001; Caro & García, 2008); and (4) problem-solving (Dabholkar et al., 1996; Caro & Roemer, 2006). These sub-dimensions are expected to positively affect interaction quality. Therefore, the first hypothesis is proposed.

H1: Higher perceptions of each interaction quality sub-dimension (H1a, H1b, H1c and H1d) will positively affect interaction quality.

Chan et al. (2010) note that physical environment quality measures the quality of the environment in which the service is delivered. Lu et al. (2009) consider physical environment quality as how the service is effectively transmitted from service providers to customers. The literature identifies the following sub-dimensions as components of physical environment quality: (1) ambience (Ko & Pastore, 2005; Dagger et al., 2007); (2) cleanliness (Lockyer, 2002, 2003; Gu & Ryan, 2008); (3) equipment (Caro & Roemer, 2006; Lu et al., 2009); (4) design (Ko & Pastore, 2005; Clemes et al., 2009, 2010); (5) comfort (Hsiao & Yang, 2010); (6) information (Caro & García, 2007); (7) convenience (Zhan & Huang, 2000); and (8) safety (Clemes et al., 2008, 2009). Higher perceptions of these sub-dimensions are expected to positively influence physical environment quality. The following hypothesis is proposed:

H2: Higher perceptions of each physical environment quality sub-dimension (H2a, H2b, H2c, H2d, H2e, H2f, H2g and H2h) will positively affect physical environment quality.

Outcome quality focuses on the outcome of the service act, indicating what customers gain from the

service; in other words, whether outcome quality meets the customer needs and wants (McDougall & Levesque, 1994; Rust & Oliver, 1994). Booms and Bitner (1981) and Zeithaml, Parasuraman and Berry (1985) suggest that customers use any tangible evidence of the service outcome as a proxy for judging performance. In general, important outcome gains can be categorized as: (1) valence (Caro & García, 2007; Clemes et al., 2009); and (2) waiting time (Pruyn & Smidts, 1998; Caro & García, 2007; Lu et al., 2009). The following hypothesis is proposed:

H3: Higher perceptions of each outcome quality sub-dimension (H3a and H3b) will positively affect outcome quality.

Brady and Cronin (2001) note that overall perceived service quality is influenced by three primary dimensions, including interaction quality, physical environment quality and outcome quality. The following hypotheses have been formulated to examine the influences of these three primary dimensions on overall perceived service quality.

H4: Higher perceptions of the quality of service interactions will positively affect overall service quality perceptions.

H5: Higher perceptions of the quality of the physical environment will positively affect overall service quality perceptions.

H6: Higher perceptions of the quality of service outcomes will positively affect overall service quality perceptions.

Caruana, Money and Berthon (2000) find that the influence of service quality on customer satisfaction is also moderated by perceived value. Although much research has paid attention to the relationship between service quality and customer satisfaction, the possible role of value as a moderating variable appears to have received less attention (Caruana et al., 2000; Chen & Tsai, 2007). Accordingly, the following hypothesis is proposed:

H7: Perceived value will moderate the relationship between service quality and customer satisfaction.

Researchers indicate that service quality is an important driver of perceived value (Cronin, Brady, & Hult, 2000; Parasuraman & Grewal, 2000). Alternatively, Chen (2008) finds that perceived value has a positive effect on customer satisfaction. According to Shonk (2006), an extensive body of research recommends that customer satisfaction with a service is influenced in part by value. Gallarza and Saura (2006) show that there appears to be a natural chain between service quality, perceived value and customer satisfaction. Thus, the following hypotheses are proposed:

H8: Higher perceptions of overall service quality will have a positive impact on perceived value.

H9: Higher perceptions of value will have a positive impact on customer satisfaction.

Hu et al. (2009) note that the overall image of the service organization is influenced by service quality. Corporate image has been considered as “a function of the accumulation of purchasing or consumption experience over time” (Andreassen & Lindestad, 1998, p. 84), or a function of the cumulative effect of customer satisfaction or dissatisfaction (Bolton & Drew, 1991; Johnson & Fornell, 1991; Fornell, 1992). Based on the review of the literature, therefore, the following hypotheses are proposed:

H10: Higher perceptions of service quality will have a positive influence on corporate image.

H11: Higher perceptions of corporate image will have a positive influence on customer satisfaction.

Dick and Basu (1994) and Andreassen and Lindestad (1998) noted that corporate image has served as an important factor influencing customer loyalty, and a favorable corporate image has an impact on repeat patronage. Alternatively, corporate image has been believed to create a halo effect on customers' satisfaction judgment (Andreassen & Lindestad, 1998). However, Bloemer, de Ruyter and Pascal (1998), Nguyen and LeBlanc (1998) and Hu et al. (2009) claim that the relationship between corporate image and customer behavior consequences has remained scarce. Therefore, the following hypothesis is proposed:

H12: Higher perceptions of corporate image will positively affect behavioral intentions.

According to Cronin and Taylor (1992), prior period perceptions of service quality cause a revised service quality assessment. Therefore, they conclude that customer satisfaction rapidly becomes part of the revised perception of service quality. Despite this substantial investment of effort, there is a vigorous debate on the conceptualization of the service quality and customer satisfaction constructs and the nature of their interrelationships (Baker & Crompton, 2000; Park, Robertson & Wu, 2006b).

H13: Higher perceptions of overall service quality will positively affect customers' overall satisfaction.

Several studies indicate that customer satisfaction has a positive influence on behavioral intentions (Kivela, Inbakaran & Reece, 1999; Baker & Crompton, 2000; Park et al., 2006b). According to Baker and Crompton (2000), high levels of satisfaction have been perceived to result in increased loyalty and future visitation. Bloemer and de Ruyter (1998)

note that studies on the relationship between customer satisfaction and behavioral intentions have remained scarce, both in actual number as well as in scope. Hence, the hypothesis is formulated as follows:

H14: Higher perceptions of customer satisfaction will positively affect behavioral intentions.

Although several studies have measured the customer experience in the transport industry (Cavana, Corbett & Lo, 2007; Park, 2007), the comparative importance of the service quality dimensions identified in these studies remains ambiguous. Clemes et al. (2008) recommend that more studies should focus on the most and least important dimensions of service quality. The following hypothesis is proposed:

H15: THSR passengers will vary in their perceptions of the importance of (a) each of the primary dimensions and (b) each of the sub-dimensions.

4. Research design and method

This study involves a two-stage design, consisting of qualitative and quantitative studies respectively. Berry and Parasuraman (1997) emphasize that organizations are required to use multiple research approaches to ensuring that they are hearing what customers are saying in order to improve service quality.

The first stage consists of focus group interviews to gain in-depth insights into passenger's experiences of taking THSR. Cox, Higginbotham and Burton (1976) and Lu et al. (2009) propose that the focus group interview is an effective qualitative technique for use in the marketing and management research. Krueger (1998) reports that a focus group study is frequently used to design a questionnaire for a quantitative survey. Edmunds (1999) recommends using five or six participants when conducting focus group interviews. Following Edmunds' (1999) recommendation, four focus group interviews were conducted in this study. Each group comprised six participants taking THSR. Participants in the focus groups were recruited using a convenience sample drawn from the Taiwan population. The focus group participants were males and females of mixed ages, represented several occupations, and had varying incomes. The domain of the construct was specified to the interviewees at the start of the focus group interviews, as suggested by Churchill (1979). During the interview process, group participants were encouraged to list all of the factors that might comprise their perceptions of the interaction quality, physical environment quality and outcome quality primary dimensions. After the focus group interviews were conducted, the participants were required to describe

the factors they believed were necessary for service quality in the transport industry in order to develop a questionnaire.

The second stage consists of a questionnaire survey which is then carried out to verify the dimensions for the transport service quality (based on Stage 1 findings) and the variation of service quality perception over time, and the antecedents and consequences of service quality in the transport industry. Therefore, the data were collected using the convenience sampling method. A questionnaire, comprising a seven-point Likert-type scale ranging from "1 (strongly disagree)" to "7 (strongly agree)", was distributed to the THSR passengers aged 18 years and older. The data were collected from a convenience sample of individuals. The questionnaires were distributed to passengers at the Taipei, Banciao, Taoyuan, Hsinchu, Taichung, Chiayi, Tainan, Zuoying-Kaohsiung THSR stations of Taiwan between January, 15 and March, 15, 2011. All items used in the questionnaires were inspected by panel members, namely, six academics from the departments of transportation technology and management in tertiary education institutions and five executives from transport organizations, ensuring that the items were an adequate and a thorough representation of the constructs under investigation. The questionnaires were examined by a pilot study in order to see if any of the statements were difficult for subjects to understand and to assess face validity. The questionnaires were distributed to 60 passengers who had taken THSR. The respondents were encouraged to make comments on any questions or statements that they thought were ambiguous or unclear. Once the pilot study was completed, the researchers worked on the text editing, spelling, legibility, instructions, layout space for responses, pre-coding, scaling issues and the general presentation of the questionnaire.

A total of 600 questionnaires was distributed and 560 questionnaires were returned. Thirty-one questionnaires were considered incomplete or not suitable for use. This resulted in 529 completed questionnaires. The usable responses were above the minimum sample size of 382 considered adequate to provide a 95% confidence level, as suggested by Mendenhall, Beaver and Beaver (1993). Table 1 presents the descriptive results of respondents' demographic factors.

The mean scores for the sum of sub-dimensions, the service quality items, the perceived value items, the corporate image items, the customer satisfaction items, and the behavioral intentions items for the 260 respondents who replied in the first month were compared with the mean scores of the 269 respondents who replied in the second month using the

extrapolation method (Armstrong & Overton, 1977). Independent t-tests indicated that two groups showed equal variances and equal means. Therefore, no early/late response bias was found.

In this study, most missing items were under 1%; only six items had missing data greater than 1%. In addition, the p-value (0.000) for the missing items was less than the 5% level of significance, indicating that these missing values were missing at random (MAR) rather than missing completely at random (MCAR). The missing values were imputed with the estimated means based on the Maximum Likelihood Estimation (MLE) method under the normality assumption (Garson, 2007).

The VARIMAX orthogonal rotation method was used in the analysis. Items were selected if their factor loadings were greater than 0.50 and loaded on a single factor, or highly loaded on a single factor and moderately loaded on the other factor. Furthermore, latent root criterion and scree testing determined 10 underlying sub-dimensions of service quality, explaining 61.08% of the variation in the data. The 10 sub-dimensions were renamed: (1) employees' conduct; (2) employees' expertise; (3) employees' problem-solving; (4) cleanliness; (5) availability of facility; (6) information; (7) ambience and design; (8) convenience; (9) valence; and (10) waiting time.

Table 1. Descriptive statistics

	Frequency	Percentage
Gender		
Male	203	38.4
Female	326	61.6
Total	529	100.0
Single		
Married	275	52.0
Divorced/separated	222	42.0
Living with a partner	16	3.0
Widowed	11	2.1
Total	5	0.9
Total	529	100.0
Age		
18-25	108	20.4
26-35	197	37.2
36-45	125	23.6
46-55	59	11.2
56-65	18	3.4
66+	22	4.2
Total	529	100.0
Level of education		
Secondary School or below	19	3.6
High School	54	10.2
Junior College	67	12.7
College or University	279	52.7
Graduate School or above	110	20.8
Total	529	100.0

Average monthly income		
TW\$0-TW\$20,000	56	10.6
TW\$20,001-TW\$30,000	75	14.2
TW\$30,001-TW\$40,000	124	23.4
TW\$40,001-TW\$50,000	110	20.8
TW\$50,001-TW\$60,000	84	15.9
TW\$60,001-TW\$70,000	39	7.4
TW\$70,001-TW\$80,000	21	4.0
TW\$80,001+	20	3.8
Total	529	100.0
Main purpose of trip		
Pleasure	195	36.9
Business	131	24.8
Visiting relatives	155	29.3
Study	36	6.8
Other	12	2.3
Total	529	100.0
Occupation		
Student	35	6.6
Teacher	54	10.2
Professional	95	18.0
Manager	67	12.7
Government employee	51	9.6
Employee of a company	96	18.1
Housewife	22	4.2
Soldier	20	3.8
Labor	13	2.5
Farmer	7	1.3
Self-employed	16	3.0
Retired	18	3.4
Unemployed	14	2.6
Other	21	4.0
Total	529	100.0

The sample was split into two halves to confirm if the extracted sub-dimensions could be used in the regression analysis and to avoid potential estimation problems (e.g., multicollinearity). The two samples revealed similar factor loading, communalities, eigenvalues, explained variance, and Cronbach's Coefficient Alphas. Therefore, the 10 sub-dimensions of service quality were deemed suitable for use in the regression analysis.

These 10 sub-dimensions were tested for reliability. The Cronbach's Coefficient Alpha values for the items ranged from 0.644 to 0.937, all above 0.60, as suggested by Churchill (1979) for exploratory research (see Table 2 in the Appendix). The Cronbach's Coefficient Alpha was also used to measure the reliability of the multi-item primary dimensions and constructs: interaction quality (0.915), physical environment quality (0.839), outcome quality (0.727), service quality (0.803), perceived value (0.816), corporate image (0.811), customer satisfaction (0.835), and behavioral intentions (0.836) (see Table 3 in the Appendix). The items were then summed using their mean scores to represent their pertaining constructs.

Ordinary least squares (OLS) regression was applied to analyze each path in the conceptual model. A series of statistical assumption tests were assessed for each of the nine regression models before the analysis in order to ensure a robust result. The results of the variation inflation factors and condition indices indicated an absence of multicollinearity. Visual examination of the residual scatter plots and histogram residual plots ensured that the linearity, normality of the error term distribution, and homoscedasticity of the error terms assumptions were met. Lastly, the Durbin-Watson test was used to ensure that the independence of the error terms was satisfied.

Diamantopoulos and Winklhofer (2001) indicate that a formative approach to the measurement is essentially based on a multiple regression with the construct representing the dependent variable and the indicators as the predictors. Therefore, several researchers propose that a multi-level hierarchical model of service quality as a formative construct should be analyzed through multiple regression (Diamantopoulos & Winklhofer, 2001; Höck & Ringle, 2006; Dagger et al., 2007).

5. Empirical results

The 10 sub-dimensions and their pertaining primary dimensions are listed in Table 4. The three sub-dimensions pertaining to interaction quality are employees' conduct, employees' expertise and employees' problem-solving. The five sub-dimensions pertaining to physical environment quality are cleanliness, availability of facility, information, ambience and design, and convenience. The two sub-dimensions pertaining to outcome quality are valence and waiting time. The summed, scaled sub-dimensions were regressed against their relevant primary dimensions.

The results of the hypothesis tests are presented in Table 4. Regression Model 1 analyzes Hypothesis 1. Hypothesis 1 tests the relationship between interaction quality and its sub-dimensions. The F statistic of 273.224 is significant at the 1% level, indicating that the identified sub-dimensions are related to interaction quality. The t-tests are significant for employees' expertise ($\beta = 0.232, p < 0.01$) and employees' problem-solving ($\beta = 0.595, p < 0.01$). However, the t-test for employees' conduct ($\beta = -0.015, p > 0.1$) is not significant. The adjusted coefficient of determination reveals that these sub-dimensions explain 60.7% of the variation in interaction quality.

Regression Model 2 analyzes Hypothesis 2. Hypothesis 2 tests the relationship between physical environment quality and its sub-dimensions. The F sta-

tistic, 128.893, is significant at the 1% level, indicating that the identified sub-dimensions are related to physical environment quality. The t-tests are significant for cleanliness ($\beta = 0.265, p < 0.01$), availability of facility ($\beta = 0.130, p < 0.01$), information ($\beta = 0.101, p < 0.01$), ambience and design ($\beta = 0.358, p < 0.01$) and convenience ($\beta = 0.119, p < 0.01$). The adjusted coefficient of determination reveals that these sub-dimensions explain 54.8% of the variation in physical environment quality.

Regression Model 3 analyzes Hypothesis 3. Hypothesis 3 tests the relationship between outcome quality and its sub-dimensions. The F statistic, 575.292, is significant at the 1% level, indicating that the identified sub-dimensions are related to outcome quality. The t-tests are significant for valence ($\beta = 0.588, p < 0.01$) and waiting time ($\beta = 0.278, p < 0.01$). The adjusted coefficient of determination reveals that these sub-dimensions explain 68.5% of the variation in interaction quality.

Regression Model 4 analyzes Hypotheses 4, 5 and 6. The relationships between service quality, interaction quality, physical environment quality and outcome quality are examined. The F statistic, 414.214, is significant at the 1% level, indicating that the three primary dimensions are related to service quality. The t-tests are significant for interaction quality ($\beta = 0.138, p < 0.01$), physical environment quality ($\beta = 0.300, p < 0.01$) and outcome quality ($\beta = 0.525, p < 0.01$). The adjusted coefficient of determination reveals that these independent variables explain 70.1% of the variation in service quality.

Regression Model 5 analyzes Hypothesis 7, the relationship between service quality and customer satisfaction moderated by perceived value. In step one, the F statistic, 946.351, is significant at the 1% level, indicating that service quality and perceived value are related to customer satisfaction. The adjusted coefficient of determination reveals that these independent variables explain 78.2% of the variation in customer satisfaction. In step two, the F statistic, 1588.243, is significant at the 1% level, indicating that the interaction term (Service quality x perceived value) is related to customer satisfaction. The adjusted coefficient of determination reveals that the independent variable (service quality) and the moderating variable (perceived value) explain 75.0% of the variation in customer satisfaction.

Regression Model 6 analyzes Hypothesis 8. Hypothesis 8 tests the relationship between perceived value and service quality. The F statistic, 783.437, is significant at the 1% level, showing that service

quality is related to perceived value. The t-test is significant for service quality ($\beta = 0.773, p < 0.01$). The adjusted coefficient of determination reveals that the independent variable explains 59.7% of the variation in perceived value.

Regression Model 7 analyzes Hypothesis 10. Hypothesis 10 tests the relationship between corporate image and service quality. The F statistic, 1225.063, is significant at the 1% level, indicating that service quality is related to corporate image. The t-test is significant for service quality ($\beta = 0.836, p < 0.01$). The adjusted coefficient of determination reveals that the independent variable explains 69.9% of the variation in corporate Image.

Regression Model 8 analyzes Hypotheses 8, 11 and 13. The relationships between customer Satisfaction, perceived value, corporate image and service quality are examined. The F statistic, 689.721, is significant at the 1% level, indicating that perceived value, service quality and corporate image are related to customer satisfaction. The t-tests are significant for perceived value ($\beta = 0.631, p < 0.01$) and corporate image ($\beta = 0.252, p < 0.01$). However, the t-test for service quality ($\beta = 0.055, p > 0.1$) is not significant. The adjusted coefficient of determination reveals that these independent variables explain 79.8% of the variation in customer satisfaction.

Regression Model 9 analyzes Hypotheses 12 and 14. The relationships between behavioral intentions, customer satisfaction and corporate image are examined. The F statistic, 517.455, is significant at the 1% level, indicating that customer satisfaction and corporate image are related to behavioral intentions. The t-tests are significant for customer satisfaction ($\beta = 0.374, p < 0.01$) and corporate image ($\beta = 0.482, p < 0.01$). The adjusted coefficient of determination reveals that these independent variables explain 66.2% of the variation in behavioral intentions.

6. Discussion

The results for Hypotheses 1 through 6 support a multi-level, hierarchical factor structure for service quality (Dabholkar et al., 1996; Brady & Cronin, 2001) for the transport industry. Hypotheses 1 through 3 support the presence of 10 sub-dimensions of service quality as perceived by passengers in the transport industry. Hypotheses 4 through 6 provide further evidence for the use of interaction quality, physical environment quality and outcome quality as primary dimensions of service quality in the transport industry. However, the five sub-dimensions explain only a small amount of variation in physical environment quality ($R^2 = 54.8\%$). This result im-

plies that there are other important sub-dimensions of physical environment quality that have not been identified in this study. However, Bruhn, Georgi and Hadwich (2008) propose that R^2 values of at least 26% represent large effect sizes in a multiple regression. In this study, all of the R^2 values in the regression models are greater than 26%. Therefore, the finding of this study supports Bruhn et al. (2008), proposing that the first-order and second-order dimensions appeared well described by the third-order service quality construct.

The statistical analyses indicate that outcome quality ($\beta = 0.525$) has a stronger effect on service quality than physical environment quality ($\beta = 0.300$) and interaction quality ($\beta = 0.138$). This finding coincides with the viewpoint that the outcome of the service encounter significantly affects the customer perceptions of service quality (Powpaka, 1996; Carman, 2000).

The statistical results reveal that physical environment quality has less effect on service quality than outcome quality. However, physical environment quality positively influences overall service quality perceptions. This result agrees with the findings of several studies (Ko & Pastore, 2005; Caro & García, 2007) that physical environment quality plays an important role in customer evaluations of service quality, even though outcome quality is a key manifestation of perceived quality. Furthermore, this finding supports several researchers' results that physical environment quality has less impact on service quality than outcome quality (e.g., Clemes et al., 2010). In addition, this result agrees with the findings of other researchers (Clemes et al., 2007, 2009) that physical environment quality is important in service delivery and that physical environment quality has a significant effect on service quality perceptions.

Interaction quality, though important, has the least influential effect on service quality. This finding supports the study of Caro and García (2007) identifying interaction quality as a major contact arena for passengers and service providers in the transport industry. This result is also consistent with the finding of Clemes et al. (2008), who argue that interaction quality plays an important role in raising the level of service quality and this dimension should not be ignored in transport studies.

The number of service quality sub-dimensions identified in this study is not the same as the number identified by Fassnacht and Koese (2006) and Clemes et al. (2007, 2009, 2010) for other service industries. This difference supports the contention

of earlier studies (van Dyke, Kappelman & Prybutok, 1997), identifying different factor structures across the service industries. The different sub-dimensional factor structure identified in this study supports the view that the dimensionality of the service quality construct depends on the service industry under investigation. The results also add support to the claims that industry- and cultural-specific measures of service quality are required to identify different dimensional structures (Clemes et al., 2001, 2007; Kang, 2006).

Hypothesis 7, relating to the positive moderating effect of perceived value on service quality and customer satisfaction, is confirmed. The statistical analysis shows that perceived value positively moderates the relationship between service quality and customer satisfaction. This finding concurs with the results of several researchers (Gallarza & Saura, 2006; Lin, 2007; Gil, Berenguer & Cervera, 2008) that the influence of service quality on customer satisfaction is not only direct but is also moderated by perceived value. In addition, the beta coefficient ($\beta = 0.867$) indicates that the moderating effect of perceived value on service quality and customer satisfaction is important in the transport industry. This result also supports the finding of Cronin and Taylor (1992) that marketers need to focus on perceived value as an important determinant of enhancing the predictive power of service quality.

Hypothesis 8, relating to the positive effect of Service quality on perceived value, is confirmed. This result is consistent with the finding of Kuo, Wu and Deng (2009) that service quality positively influences perceived value. In addition, this finding agrees with the contentions of Sweeney, Soutar and Johnson (1997) and Chen (2007) in identifying service quality as an important indicator of perceived value.

Hypothesis 10, relating to the positive effect of service quality on corporate image, is confirmed. This finding concurs with the results of several researchers (Zeithaml, 1988; Park et al., 2004, 2006b; Pina, Martinez, de Chernatony & Drury, 2006) that service quality positively affects corporate image. Furthermore, this finding is consistent with the Gummesson and Grönroos (1988) study that corporate image is an important factor in the overall evaluation of service and the organization.

Hypotheses 9 and 11, relating to the positive effects of perceived value and corporate image on customer satisfaction, are confirmed. This result agrees with the finding of Duman and Mattila (2005) that perceived value has been used to examine the role of customer satisfaction in the relationship between affection and value by demonstrating the role of selected

affective factors on value in the context of the passenger vacation experiences. This result indicates that these affective factors are key determinants of perceived value. In addition, this finding supports Gallarza and Saura's (2006) study that the existence of perceived value resulting in positive satisfaction in the university student travel satisfaction has been assessed by exploring the constructs of perceived value and satisfaction. Similarly, the result is consistent with the findings of Oyewole, Sankaran and Choudhury (2007) that corporate image has a positive influence on customer satisfaction in the transport industry. Also, the finding agrees with Bolton and Drew (1991) who propose that corporate image has been considered as a function of the cumulative effect of customer satisfaction or dissatisfaction. Hypothesis 13, relating to the positive effect of service quality on customer satisfaction, is confirmed. For this hypothesis, the result is consistent with Omachonu, Johnson and Onyeaso's (2008) study that service quality does not have an influence on customer satisfaction in the long term. In addition, this finding supports Ha's (2006) study that service quality may not be an antecedent of customer satisfaction because service quality is more abstract than customer satisfaction and it is likely to be influenced by variables such as advertising, other forms of communication and the experience of other customers.

Hypotheses 12 and 14, relating to the positive effects of corporate image and customer satisfaction on behavioral intentions, are confirmed. This result agrees with several researchers (Fornell, 1992; Chen & Tsai, 2007; Liu & Liao, 2010) who show that customer satisfaction positively affects behavioral intentions. In addition, this finding concurs with the results of several other researchers (Swanson & Kelley, 2001; Lam & Hsu, 2006) that customer satisfaction can create more positive evaluations and future behavior such as revisiting the same organization. In addition, this result is consistent with Berry's (1995) proposition that THSR can enhance a favorable behavioral intention among passengers by promoting its trustworthy corporate image.

Although the beta coefficient indicates that customer satisfaction ($\beta = 0.374$) has less impact on behavioral intentions than corporate image ($\beta = 0.482$), customer satisfaction does have a positive effect on behavioral intentions. This result supports Kang, Okamoto and Donovan's (2004) finding that customer behavioral intentions are positive reactions on the part of satisfied customers appearing as outcome dimensions in studies of customer satisfaction.

Hypothesis 15 postulates that the three primary dimensions and pertaining sub-dimensions as perceived by passengers vary in importance. Hypothesis 15 is supported by the statistical results. The most important primary dimension perceived by customers is outcome quality ($\beta = 0.525$), followed by physical environment quality ($\beta = 0.300$) and interaction quality ($\beta = 0.138$). The derived importance of the sub-dimensions is summarized in Figure 2, listing all of the standardized beta coefficients for the nine models.

Conclusions

The results of this study add support to using a multi-level, hierarchical framework to conceptualize and measure passenger perceptions of service quality, value, corporate image, customer satisfaction and behavioral intentions in the transport industry. This methodological approach is similar to those used by Dabholkar et al. (1996), Brady and Cronin (2001), Clemes et al. (2007, 2009) and Dagger et al. (2007) to analyze these constructs in other service industries.

Employees' conduct is one of the service quality sub-dimensions identified in the factor solution. This sub-dimension is not identified as significant in Regression Model 1 and has not contributed to the variation in interaction quality. Therefore, this sub-dimension should not be considered as comprise component of interaction quality. The different sub-dimensional factor structure identified in this study supports the view that the dimensionality of the service quality construct depends on the different industries under investigation, and supports the claims that industry- and cultural-specific measures of service quality need to be developed to identify different dimensional structures (Dabholkar et al., 1996; Brady & Cronin, 2001; Clemes et al., 2001).

The statistical analyses show that perceived value has the most influential moderating effect on the relationship between service quality and customer satisfaction ($\beta = 0.867$). This result supports the empirical findings of Caruana et al. (2000) that perceived value plays a moderating role between service quality and customer satisfaction. Also, the positive relationship between perceived value, service quality and customer satisfaction suggests that satisfaction increases after passengers experience high service quality and have high perceptions of value.

This study also provides a framework for understanding the interrelationships between behavioral intentions and other higher order constructs. The results of this study also provide a framework for understanding the interrelationships between behavioral intentions and the higher order constructs.

The results of this study demonstrate that service quality has a direct impact on customer perceptions of value and value then influences customer satisfaction directly. The positive relationship between service quality and perceived value indicates that higher levels of perceived service quality make passengers more willing to pay a higher price to take THSR. Increased perceived value then results in customer satisfaction based on the positive relationship between perceived value and customer satisfaction. In addition, the results indicate that service quality has a direct influence on corporate image. Thus, higher levels of service quality improve the corporate image of THSR and corporate image then directly influences customer satisfaction. In this study, however, corporate image has less influence on customer satisfaction than perceived value. The analysis also illustrates that service quality positively influences customer satisfaction. The result supports service quality being an antecedent of satisfaction (Churchill & Suprenant, 1982), determining customer satisfaction (Fornell et al., 1996).

Customer satisfaction and corporate image directly influence behavioral intentions. Satisfied customers form favorable behavioral intentions to revisit or return to take THSR when they experience high levels of service quality that produce a favorable corporate image. Although corporate image has a stronger influence on behavioral intentions than customer satisfaction in this study, Hsu, Chen and Hsueh (2006) demonstrate that corporate image and customer satisfaction positively affect customer loyalty. According to Chou, Kim, Kuo and Ou (2011), an increase in customer satisfaction and corporate image can improve customer loyalty and retention rates, which are the decisive factors in profitability for service-oriented enterprises. In addition, passenger satisfaction has a positive influence on behavioral intentions, suggesting that satisfied passengers will revisit or return to take THSR and recommend THSR to others. In contrast, corporate image has a relatively high positive effect on behavioral intentions. This implies that passengers forming a positive overall impression of the corporate image of THSR are more likely to take THSR again and recommend THSR to others.

This study identifies three primary dimensions of transport service quality and 10 sub-dimensions pertaining to the primary dimensions. Transport management can use the multi-level, hierarchical model developed in this study in their strategic planning because the model provides a framework for evaluating passenger perceptions of service quality. However, as the dimensions of service quality vary across industries and cultures, transport managers should note that the

primary- and sub-dimensional structures must be determined for their own specific organization and cultural setting to measure accurately passenger perceptions of their experiences taking THSR.

The results indicate that perceived value and service quality have an independent influence on customer satisfaction. The positive regression coefficient for the interaction between service quality and perceived value demonstrates that the moderating variable (service quality x perceived value) has a positive impact on customer satisfaction. Therefore, transport management should realize that perceived value is often seen to be a subjective construct playing a moderating role between service quality and customer satisfaction as suggested by Caruana et al. (2000).

The findings provide transport management with an improved understanding of the influence of service quality on perceived value and corporate image, the influences of perceived value, corporate image and service quality on customer satisfaction, and the effects of corporate image and customer satisfaction on behavioral intentions. Management needs to be aware that increasing service quality should increase their passengers' perceptions of value and create favorable impressions of THSR. In addition, if transport management can ensure a higher level of perceived value, corporate image and service quality, the level of customer satisfaction should increase. Furthermore, higher satisfaction levels should ultimately increase passengers' favorable intentions to revisit or return to take THSR, and foster positive word-of-mouth recommendations for THSR.

In addition, Chou et al. (2011) indicate that THSR provides superior level of service maturity compared to Korean Train eXpress (KTX). Alternatively, Liou (2009) notes that the effects of passenger service and passenger recognition on the reliability of Japan Rail Shinkansen (JRS) have been found to be stronger than those for THSR. Apparently, JRS has been found to be more efficient and better handling of passenger complaints than THSR.

The results of this study indicate that outcome quality is the most important primary dimension of service quality in a transport context, followed by physical environment quality and then Interaction quality. Management should recognize that the order of importance of the primary dimensions may vary

across different types of transport. Transport management participating in the survey should concentrate on the sub-dimensions under outcome quality and improve the performance of THSR on the sub-dimensions. Resources should be allocated to the sub-dimensions based on their level of importance. However, the sub-dimensions pertaining to interaction quality and physical environment quality should also be resourced, because passengers' overall perceptions of transport service quality are also influenced by employee and passenger relationships, and the relationship between the service environment and passengers.

It would be both interesting and useful to extend this analysis to other scenarios such as limited information. First, this research focused only on the perceptions of passengers and did not measure the perceptions of employees and managers regarding customer behavioral intentions and the relevant constructs. Despite this difficulty, this study conducted in-depth focus group interviews to identify and examine all of the dimensions of the service quality construct for THSR, because focus group interviews are believed to be more useful than relying only on a literature review. However, there may be some other dimensions of service quality that have not been identified in the conceptual framework of this study. Therefore, future researchers should seek to identify any additional factors in the transport industry that significantly impact on passengers' perceptions of service quality that have not been identified by this study. Secondly, because this study was conducted only in Taiwan, future researchers should seriously consider the issue of cultural differences when applying the results of this study to other countries. Thirdly, this research was limited to the Taiwan High-Speed Rail Corporation, future studies should attempt to examine behavioral intentions and their relevant constructs in different transport sectors, such as airlines, buses, trains, cruise ships. Finally, there has been no hands-on experience in the passenger service since high-speed rail transport is new in Taiwan. Marketing and promoting service quality and customer satisfaction have been primary objectives. A study of marketing strategy in high-speed rail transport indicates that price strategies and promotion programs for corporate customers and travel agencies should be developed.

References

1. Alexandris, K., Dimitriadis, N. & Markata, D. (2002). Can perceptions of service quality predict behavioral intentions? An exploratory study in the hotel section in Greece, *Managing Service Quality*, 12 (4), pp. 224-232.
2. Anderson, E.W. & Sullivan, M. (1993). The antecedents and consequences of customer satisfaction for firms, *Marketing Science*, 12 (2), pp. 125-143.
3. Andreassen, T.W. & Lindestad, B. (1998). Customer loyalty and complex services: The impact of corporate image on quality, customer satisfaction and loyalty for customers with varying degrees of service expertise, *International Journal of Service Industry Management*, 9 (1), pp. 7-23.

4. Armstrong, S.J. & Overton, T.S. (1997). Estimating response bias in mail surveys, *Journal of Marketing Research*, 14 (3), pp. 396-402.
5. Bagozzi, R.P. (1980). *Causal models in marketing*, New York, NY: John Wiley.
6. Baker, D.A. & Crompton, J.L. (2000). Quality, satisfaction, behavioral intentions, *Annals of Tourism Research*, 27 (3), pp. 785-804.
7. Berry, L.L. (1995). Relationship marketing of services: growing interest, emerging perspectives, *Journal of the Academy of Marketing Science*, 23 (4), pp. 236-245.
8. Berry, L.L. & Parasuraman, A. (1997). Listening to the customer: the concept of a service-quality information system, *Sloan Management Review*, 38 (3), pp. 65-76.
9. Bloemer, J.M.M. & de Ruyter, K. (1998). On the relationship between store image, store satisfaction, and store loyalty, *European Journal of Marketing*, 32 (5/6), pp. 499-514.
10. Bloemer, J.M.M., de Ruyter, K. & Pascal, P. (1998). Investigating drivers of loyalty: the complex relationship between image, service quality and satisfaction, *International Journal of Bank Marketing*, 16 (7), pp. 276-286.
11. Bolton, R.N. & Drew, J.H. (1991). A multistage model of customers' assessment of service quality and value, *Journal of Consumer Research*, 17 (4), pp. 375-384.
12. Booms, B.H. & Bitner, M.J. (1981). Marketing services by managing the environment, *Cornell Hotel and Restaurant Administration Quarterly*, 23 (5), pp. 35-39.
13. Brady, M.K. & Cronin, J.J. (2001). Some new thoughts on conceptualizing perceived service quality: a hierarchical approach, *Journal of Marketing*, 65 (3), pp. 34-49.
14. Bruhn, M. Georgi, D. & Hadwich, K. (2008). Customer equity management as formative second-order construct, *Journal of Business Research*, 61 (12), pp. 1292-1301.
15. Buttle, F. (1996). SERVQUAL: review, critique, research agenda, *European Journal of Marketing*, 30 (1), pp. 8-35.
16. Carman, J.M. (2000). Patient perceptions of service quality: combining the dimensions, *Journal of Services Marketing*, 14 (4), pp. 57-65.
17. Caro, L.M. & Roemer, E. (2006). *Developing a multi-dimensional and hierarchical service quality model for the travel and tourism industry*, Paper No. 06/18. Bradford, UK: Bradford University.
18. Caro, L.M. & García, J.A.M. (2007). Measuring perceived service quality in urgent transport service, *Journal of Retailing and Consumer Services*, 14(1), pp. 60-72.
19. Caro, L.M. & García, J.A.M. (2008). Developing a multi-dimensional and hierarchical service quality model for the travel agency industry, *Tourism Management*, 29 (4), pp. 706-720.
20. Cavana, R.Y., Corbett, L.M. & Lo, Y.L.G. (2007). Developing zones of tolerance for managing passenger rail service quality, *International Journal of Quality and Reliability Management*, 24 (1), pp. 7-31.
21. Caruana, A., Money, A.H. & Berthon, P.R. (2000). Service quality and satisfaction: The moderating role of value, *European Journal of Marketing*, 34 (11/12), pp. 1338-1353.
22. Chan, T., Fieft, E., Gable, G. & Stark, K. (2010). *Business service management*, Retrieved October 26, 2010, from http://www.smartservicesrc.com.au/PDF/Business_Service_Management_Volume%202_May2010.pdf
23. Chen, C.F. (2007). Experience quality, perceived value, satisfaction and behavioral intentions for heritage tourists, *Proceedings of the 13th Asia Pacific Management Conference*, pp. 1130-1136.
24. Chen, C.F. (2008). Investigating structural relationships between service quality, perceived value, satisfaction, and behavioral intentions for air passengers: Evidence from Taiwan. *Transportation Research Part A: Policy and Practice*, 42 (4), pp. 709-717.
25. Chen, C.F. & Tsai, D.C. (2007). How destination image and evaluative factors affect behavioral intentions? *Tourism Management*, 28 (4), pp. 1115-1122.
26. Chen, M. (2004). Romance of rail jeopardizes domestic air routes. Retrieved February 21, 2010, from <http://www.taiwantoday.tw/ct.asp?xItem=45023&CtNode=429>.
27. Chou, J.S. & Kim, C.W. (2009). A structural equation analysis of the QSL relationship with passenger riding experience on high-speed rail: an empirical study of Taiwan and Korea, *Expert Systems with Applications: An International Journal*, 36 (3), pp. 6945-6955.
28. Chou, J.S., Kim, C.W., Kuo, Y.C. & Ou, N.C. (2011). Deploying effective service strategy in the operations stage of high-speed rail, *Transportation Research Part E: Logistics and Transportation Review*, 47 (4), pp. 507-519.
29. Churchill, G.A. (1979). A paradigm for developing better measures of marketing constructs, *Journal of Marketing Research*, 16 (1), pp. 64-73.
30. Churchill, G.A. & Surprenant, C. (1982). An investigation into the determinants of customer satisfaction, *Journal of Marketing Research*, 19 (4), pp. 491-504.
31. Clemes, M.D., Gan, C.E.C. & Kao, T.H. (2007). University student satisfaction: an empirical analysis, *Journal of Marketing for Higher Education*, 17 (2), pp. 292-325.
32. Clemes, M.D., Gan, C.E.C. Kao, T. H., & Choong, M. (2008). An empirical analysis of customer satisfaction in international air travel, *Innovative Marketing*, 4 (1), pp. 49-62.
33. Clemes, M.D., Gan, C. & Ren, M. (2010). Synthesizing the effects of service quality, value, and customer satisfaction on behavioral intentions in the motel industry: an empirical analysis, *Journal of Hospitality and Tourism Research*, November, pp. 1-39.
34. Clemes, M.D., Gan, C. & Zhang, D. (2010). Customer switching behavior in the Chinese retail banking industry, *International Journal of Bank Marketing*, 8 (7), pp. 519-546.

35. Clemes, M.D., Ozanne, L.K. & Laurensen, W.L. (2001). Patients' perceptions of service quality dimension: an empirical examination of health care in New Zealand, *Health Marketing Quarterly*, 19 (1), pp. 3-22.
36. Clemes, M.D., Wu, J.H.C., Hu, B.D. & Gan, C. (2009). An empirical study of behavioral intentions in the Taiwan hotel industry, *Innovative Marketing*, 5 (3), pp. 30-50.
37. Coltman, T., Devinney, T.M., Midgley, D.F. & Venaik, S. (2008). Formative versus reflective measurement models: two applications of formative measurement, *Journal of Business Research*, 61 (12), pp. 1250-1262.
38. Connor, D. & Davidson, J. (1997). *Marketing your consulting and professional services*, New York, NY: John Wiley and Sons.
39. Cox, K.K., Higginbotham, J.B. & Burton, J. (1976). Applications of focus group interviews in marketing, *Journal of Marketing*, 40 (1), pp. 77-80.
40. Cronin, J.J., Brady, M.K. & Hult, G.T.M. (2000). Assessing the effects of quality, value and customer satisfaction on consumer behavioral intentions in service environments, *Journal of Retailing*, 76 (2), pp. 193-218.
41. Cronin, J.J. & Taylor, S.A. (1992). Measuring service quality: a re-examination and extension, *Journal of Marketing*, 56 (3), pp. 55-68.
42. da Costa, M.C., Deliza, R., Rosenthal, A., Hedderley, D. & Frewer, L. (2000). Non-conventional technologies and impact on consumer behavior, *Trends in Food Science and Technology*, 11 (4/5), pp. 188-193.
43. Dabholkar, P.A., Shepherd, D.C. & Thorpe, D.I. (2000). A comprehensive framework for service quality: an investigation of critical conceptual and measurement issues through a longitudinal study, *Journal of Retailing*, 16 (2), pp. 139-173.
44. Dabholkar, P.A., Thorpe, D.I. & Rentz, J.O. (1996). A measure of service quality for retail stores: scale development and validation, *Journal of the Academy of Marketing Science*, 24 (1), pp. 3-16.
45. Dagger, T.S., Sweeney, J.C. & Johnson, L.W. (2007). A hierarchical model of health service quality: scale development and investigation of an integrated model, *Journal of Service Research*, 10 (2), pp. 123-142.
46. Diamantopoulos, A. (2006). The error term in formative measurement models: Interpretation and modeling implications, *Journal of Modeling in Management*, 1 (1), pp. 1-17.
47. Diamantopoulos, A. & Winklhofer, H.M. (2001). Index construction with formative indicators: an alternative to scale development, *Journal of Marketing Research*, 38 (2), pp. 269-277.
48. Dick, A. & Basu, K. (1994). Customer loyalty: toward an integrated conceptual framework, *Journal of Academy of Marketing Science*, 22 (2), pp. 99-113.
49. Duman, T. & Mattila, A.S. (2005). The role of affective factors on perceived cruise vacation value, *Tourism Management*, 26 (3), pp. 311-323.
50. Edmunds, H. (1999). *The focus group research handbook*, Lincolnwood, IL: NTC Business Books.
51. Fassnacht, M. & Koese, I. (2006). Quality of electronic services: conceptualizing and testing a hierarchical model, *Journal of Service Research*, 9 (1), pp. 19-37.
52. Fishbein, M. & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: an introducing to theory and research*, Reading, MA: Addison-Wesley.
53. Fornell, C. (1992). A national customer satisfaction barometer: the Swedish experience, *Journal of Marketing*, 56 (1), pp. 6-21.
54. Gallarza, M.G. & Saura, I.G. (2006). Value dimensions, perceived value, satisfaction and loyalty: an investigation of university students' travel behavior, *Tourism Management*, 27 (3), pp. 437-452.
55. Garson, G.D. (2007). *Statnotes: Topics in multivariate analysis*, Retrieved December 10, 2010, from <http://faculty.chass.ncsu.edu/garson/PA765/statnote.htm>.
56. Gil, I., Berenguer, G. & Cervera, A. (2008). The roles of service encounters, service value, and job satisfaction in achieving customer satisfaction in business relationships, *Industrial Marketing Management*, 37 (8), pp. 921-939.
57. Gotlieb, J.B., Grewal, D. & Brown, S.W. (1994). Consumer satisfaction and perceived quality: complementary or divergent constructs? *Journal of Applied Psychology*, 79 (6), pp. 875-885.
58. Gu, H., & Ryan, C. (2008). Chinese clientele at Chinese hotels: preferences and satisfaction, *International Journal of Hospitality Management*, 27 (3), pp. 337-345.
59. Gummesson, E. & Grönroos, C. (1988). Quality of services: lessons from the product sector, In C. Surprenant (ed). *Add value to your service*, Chicago, IL: American Marketing Association.
60. Ha, H.Y. (2006). An integrative model of consumer satisfaction in the context of e-services, *International Journal of Consumer Studies*, 30 (2), pp. 137-149.
61. Heskett, J.L., Jones, T.O., Loveman, G.W., Sasser, W.E. & Schlesinger, L.A. (1994). Putting the service: profit chain to work, *Harvard Business Review*, 72 (2), pp. 164-172.
62. Höck, M. & Ringle, C.M. (2006). Strategic networks in the software industry: an empirical analysis of the value continuum, *IFSAM VIIIth World Congress*, Berlin, Germany.
63. Hsiao, C.H. & Yang, C. (2010). Predicting the travel intention to take high speed rail among college students, *Transportation Research Part F: Traffic Psychology and Behavior*, 13 (4), pp. 277-287.
64. Hsu, S.H., Chen, W.H. & Hsueh, J.T. (2006). Application of customer satisfaction study to derive customer knowledge, *Total Quality Management and Business Excellence*, 17 (4), pp. 439-454.
65. Hu, H.H.S., Kandampully, J. & Juwaheer, T.D. (2009). Relationships and impacts of service quality, perceived value, customer satisfaction, and image: an empirical study, *The Service Industries Journal*, 29 (2), pp. 111-125.
66. Jarvis, C.B., MacKenzie, S.B. & Podsakoff, P.M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research, *Journal of Consumer Research*, 30 (2), pp. 199-218.

67. Jen, W. & Hu, K.C. (2003). Application of perceived value model to identify factors affecting passengers' repurchase intentions on city bus: a case of the Taipei metropolitan area, *Transportation*, 30 (3), pp. 307-327.
68. Johnson, M.D. & Fornell, C.A. (1991). A framework for comparing customer satisfaction across individuals and product categories, *Journal of Economic Psychology*, 12 (2), pp. 267-286.
69. Kang, G.D. (2006). The hierarchical structure of service quality: integration of technical and functional quality, *Managing Service Quality*, 16 (1), pp. 37-50.
70. Kang, S.S., Okamoto, N. & Donovan, H.A. (2004). Service quality and its effect on customer satisfaction and customer behavioral intentions: hotel and Ryokan guests in Japan, *Asia Pacific Journal of Tourism Research*, 9 (2), pp. 189-202.
71. Keller, K.L. (1993). Conceptualizing, measuring, and managing consumer-based brand equity, *Journal of Marketing*, 57 (1), pp. 1-22.
72. Kivela, J., Inbakaran, R. & Reece, J. (1999). Consumer research in the restaurant environment, part II: research design and analytical methods. International, *Journal of Contemporary Hospitality Management*, 11 (6), pp. 269-286.
73. Ko, Y.J. & Pastore, D.L. (2005). A hierarchical model of service quality for the recreational sport industry, *Sport Marketing Quarterly*, 14 (2), pp. 84-97.
74. Krueger, R.A. (1998). *Focus groups: A practical guide for applied research*, Newbury Park, CA: Sage.
75. Kuo, Y.F., Wu, C.M. & Deng, W.J. (2009). The relationships among service quality, perceived value, customer satisfaction, and post-purchase intention in mobile value-added services, *Computers in Human Behavior*, 25 (4), pp. 887-896.
76. Lam, T. & Hsu, C. (2006). Predicting behavioral intention of choosing a travel destination, *Tourism Management*, 27 (4), pp. 589-599.
77. Lin, W.B. (2007). The exploration of customer satisfaction model from a comprehensive perspective, *Expert Systems with Applications*, 33 (1), pp. 110-121.
78. Liou, D.Y. (2009). When trains fly: market response to high-speed rail service operations between Taiwan and Japan, *Yu Da Academic Journal*, 21, pp. 17-42.
79. Liu, C.H. & Liao, S.K. (2010). An empirical study of factors affecting customer loyalty: Taiwan high-speed rail service industry as an example, *International Journal of Services Operations and Informatics*, 5 (2), pp. 130-157.
80. Lockyer, T. (2002). Business guests' accommodation selection: the view from both sides, *International Journal of Contemporary Hospitality Management*, 14 (6), pp. 294-300.
81. Lockyer, T. (2003). Hotel cleanliness: how do guests view it? Let us get specific, A New Zealand study, *International Journal of Hospitality Management*, 22 (3), pp. 297-305.
82. Lu, Y., Zhang, L. & Wang, B. (2009). A multi-dimensional and hierarchical model of mobile service quality, *Electronic Commerce Research and Applications*, 8 (5), pp. 228-240.
83. McDougall, G.H.G. & Levesque, T.J. (1994). A revised view of service quality dimension: an empirical investigation, *Journal of Professional Service Marketing*, 11 (1), pp. 189-209.
84. Mendenhall, W., Beaver, J.E. & Beaver, R.J. (1993). *Statistics for business and economics* (7th ed.), Upper Saddle River, NJ: Prentice-Hall.
85. Nadiri, H., Hussain, K., Ekiz, E.H. & Erdogam, S. (2008). An investigation on the factors influencing passengers' loyalty in the north Cyprus national airline, *TQM Journal*, 20 (3), pp. 265-280.
86. Nakagawa, D. & Hatoko, M. (2007). Re-evaluation of Japanese high-speed rail construction: recent situation of the north corridor Shinkansen and its way to completion, *Transport Policy*, 14 (2), pp. 150-164.
87. Nguyen, N. & LeBlanc, G. (1998). The mediating role of corporate image on customers' retention decisions: an investigation in financial services, *International Journal of Bank Marketing*, 16 (2), pp. 52-65.
88. Omachonu V., Johnson W.C. & Onyeaso G. (2008). An empirical test of the drivers of overall customer satisfaction: evidence from multivariate granger causality, *Journal of Services Marketing*, 22 (6), pp. 434-444.
89. Oyewole, P., Sankaran, M. & Choudhury, P. (2007). Marketing airline services in Malaysia: a consumer satisfaction orientation approach, *Innovative Marketing*, 3 (1), pp. 56-70.
90. Pantouvakis, A. & Lymperopoulos, K. (2008). Customer satisfaction and loyalty in the eyes of new and repeat customers: evidence from the transport sector, *Managing Service Quality*, 18 (6), pp. 623-643.
91. Parasuraman, A. & Grewal, D. (2000). The impact of technology on the quality-value-loyalty chain: a research agenda, *Journal of the Academy of Marketing Science*, 28 (1), pp. 168-174.
92. Parasuraman, A., Zeithaml, V.A. & Malhotra, A. (2005). E-S-QUAL: A multiple-item scale for assessing electronic service quality, *Journal of Service Research*, 7 (3), pp. 213-233.
93. Park, J.W. (2007). Passenger perceptions of service quality: Korean and Australian case studies, *Journal of Air Transport Management*, 13 (4), pp. 238-242.
94. Park, J.W., Robertson, R. & Wu, C.L. (2004). The effect of airline service quality on passengers' behavioral intentions: A Korean case study, *Journal of Air Transport Management*, 10 (6), pp. 435-439.
95. Park, J.W., Robertson, R. & Wu, C.L. (2006a). Modeling the impact of airline service quality and marketing variables on passengers' future behavioral intentions, *Transportation Planning and Technology*, 29 (5), pp. 359-381.
96. Park, J.W., Robertson, R. & Wu, C.L. (2006b). The effects of individual dimensions of airline service quality: findings from Australian domestic air passengers, *Journal of Hospitality and Tourism Management*, 113 (2), pp. 161-176.
97. Patterson, P.G. & Spreng, R.A. (1997). Modeling the relationship between perceived value, satisfaction and repurchase intentions in a business-to-business, services context: an empirical examination, *International Journal of Service Industry Management*, 8 (5), pp. 414-434.

98. Pina, J.M., Martinez, E., de Chernatony, L. & Drury, S. (2006). The effect of service brand extensions on corporate image: an empirical model, *European Journal of Marketing*, 40 (1/2), pp. 174-197.

99. Powpaka, S. (1996). The role of outcome quality as a determinant of overall service quality in different categories of services industries: an empirical investigation, *Journal of Services Marketing*, 10 (2), pp. 5-25.

100. Pruyn, A.T.H. & Smidts, A. (1998). Effects of waiting on the satisfaction with the service: beyond objective time measures, *International Journal of Research in Marketing*, 15 (4), pp. 321-334.

101. Quinn, B.A. (2007). Adapting service quality concepts to academic libraries, *Journal of Academic Librarianship*, 23 (5), pp. 359-369.

102. Ravald, A. & Grönroos, C. (1996). The value concept and relationship marketing, *European Journal of Marketing*, 30 (2), pp. 19-30.

103. Roest, H. & Pieters, R. (1997). The nomological net of perceived service quality, *International Journal of Service Industry Management*, 8 (4), pp. 336-351.

104. Rossiter, J.R. (2002). The C-OAR-SE procedure for scale development in marketing, *International Journal of Research in Marketing*, 19 (4), pp. 305-335.

105. Rust, R.T. & Oliver, R.L. (1994). Service quality: insights and managerial implications from the frontier, In R.T. Rust et al. (eds). *Service quality: New directions in theory and practice*. Thousand Oaks, CA: Sage, 1-19.

106. Shonk, D.J. (2006). *Perceptions of service quality, satisfaction and the Intent to return among tourists attending a sporting event*, Unpublished doctoral dissertation, Ohio State University, Columbus.

107. Swanson, S.R. & Kelley, S.W. (2001). Attributions and outcomes of the service recovery process, *Journal of Marketing Theory and Practice*, 9 (4), pp. 50-65.

108. Sweeney, J.C., Soutar, G.N. & Johnson, L.W. (1997). Retail service quality and perceived value: a comparison of two models, *Journal of Retailing and Consumer Services*, 4 (1), pp. 39-48.

109. Taiwan High-Speed Rail Consortium (2007). Taiwan high-speed rail line network, Taiwan Retrieved February 21, 2010, from <http://www.railway-technology.com/projects/taiwan>.

110. Teas, R.K. (1993). Consumer expectations and the measurement of perceived service quality, *Journal of Professional Services Marketing*, 8 (2), pp. 33-54.

111. Treacy, M. & Wiersema, F. (1993). Customer intimacy and other value disciplines, *Harvard Business Review*, 71 (1), pp. 84-93.

112. van Dyke, T.P., Kappelman, L.A. & Prybutok, V.R. (1997). Measuring information systems service quality: concerns on the use of the SERVQUAL questionnaire, *MIS Quarterly*, 21 (2), pp. 195-208.

113. Wang, Y., Chen, R. & Zhao, P. (2007). The determinants of customer satisfaction after service failure and recovery, *Proceedings of Service Systems and Service Management, 2007 International Conference*, Tsing-Hua University, China.

114. World of Technology (2008). *Spider webs in space*, Retrieved February 21, 2010, from http://mytechnologyworld9.blogspot.com/2008_11_01_archive.html.

115. Zeithaml, V.A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence, *Journal of Marketing*, 52 (3), pp. 2-22.

116. Zeithaml, V.A., Parasuraman, A. & Berry, L.L. (1985). Problems and strategies in services marketing, *Journal of Marketing*, 49 (2), pp. 33-46.

117. Zhang, D.Y. & Huang, Z.D. (2000). An empirical study of the determinants of the waiting service quality: the case of the service of railway stations, *Sun Yet-Sen Management Review*, 8 (1), pp. 123-151.

Appendix

Table 2. Reliability of scaled items for sub-dimensions

Sub-dimension	Cronbach's alpha	Measurement items	Rotation loading
Employees' conduct	0.937	I can depend on the staff of THSR being friendly.	0.800
		The staff of THSR always provides me with the best service.	0.782
		The behavior of the staff of THSR allows me to trust their services.	0.763
		The attitude of the staff of THSR demonstrates their willingness to help me.	0.758
		I can count on the staff of THSR knowing their jobs/responsibilities.	0.746
		I can rely on the staff of THSR taking actions to satisfy my needs.	0.720
Employees' expertise	0.856	I can count on the staff of THSR knowing their jobs/responsibilities.	0.746
		The staff of THSR are competent.	0.695
		The staff of THSR understand that I rely on their professional knowledge to meet my needs.	0.682
Employees' problem-solving	0.851	When I have a problem, the staff of THSR show a sincere interest in solving it.	0.788
		The staff of THSR are able to handle my complaints directly and immediately.	0.692
		The staff of THSR understand the importance of resolving my complaints.	0.653
Cleanliness	0.719	The THSR car is clean.	0.691
		The information center in the THSR station is clean.	0.661
		The toilet of THSR is clean.	0.627
Availability of facility	0.783	There are noticeable sprinkler systems in the THSR car.	0.886
		There are accessible fire exits in the THSR car.	0.821
		The equipment of THSR is in good condition.	0.679

Table 2 (cont.). Reliability of scaled items for sub-dimensions

Sub-dimension	Cronbach's alpha	Measurement items	Rotation loading
Information	0.668	THSR understands the information that the passengers need. I count on the information that THSR provides. THSR tells me the accurate time on which it provides service.	0.533 0.518 0.502
Ambience & design	0.775	THSR is aesthetically attractive. To experience with a THSR ride is what I am looking for in a mass transportation setting. Taking THSR is safe and comfortable. I really enjoy the atmosphere of experiencing with a THSR ride.	0.667 0.641 0.557 0.550
Valence	0.823	I believe THSR tries to give me what I want. I would say that I feel good about what I receive from THSR. I would evaluate the outcome of the THSR services favorably.	0.675 0.665 0.638
Waiting time	0.792	THSR understands that waiting time is important to me. THSR tries to minimize my waiting time. I rarely have to wait long to receive the service of THSR.	0.703 0.696 0.649

Table 3. Reliability of scaled items for primary dimensions and behavioral intentions and related constructs

Primary dimension	Cronbach's alpha	Measurement items
Interaction quality	0.915	The interaction I have with the THSR staff is excellent. The interaction I have with the THSR staff is of a high standard.
Physical environment quality	0.839	I think that the physical environment (e.g., ticket counters, platforms, seats, etc.) of THSR is excellent. The physical environment of THSR is of a high standard.
Outcome quality	0.727	I feel good about what THSR provides to its passengers. I always have an excellent experience when I have a ride of THSR.
Construct	Cronbach's alpha	Measurement items
Service quality	0.803	The overall quality of the THSR services is good. THSR provides high quality services. I believe that THSR offers the service that is superior in every way.
Perceived value	0.816	The THSR riding experience is worth the money. THSR offers good value for the price. The overall value of taking THSR is high.
Service quality	0.803	The overall quality of the THSR services is good. THSR provides high quality services. I believe that THSR offers the service that is superior in every way.
Perceived value	0.816	The THSR riding experience is worth the money. THSR offers good value for the price. The overall value of taking THSR is high.
Corporate image	0.811	I have always had a good impression of THSR. I believe that THSR has a better image than its competitors opinion, THSR has a good image in the minds of its passengers.
Customer satisfaction	0.835	My choice to use THSR was wise one. I think that I did the right thing when I decided to use THSR. I am satisfied with my decision to take THSR.
Behavioral intentions	0.836	I always say positive things about THSR to other people. If I could, I would take THSR again. I always consider THSR to be the first one on my list when searching for public transportation systems. I would recommend THSR to my friends or others.

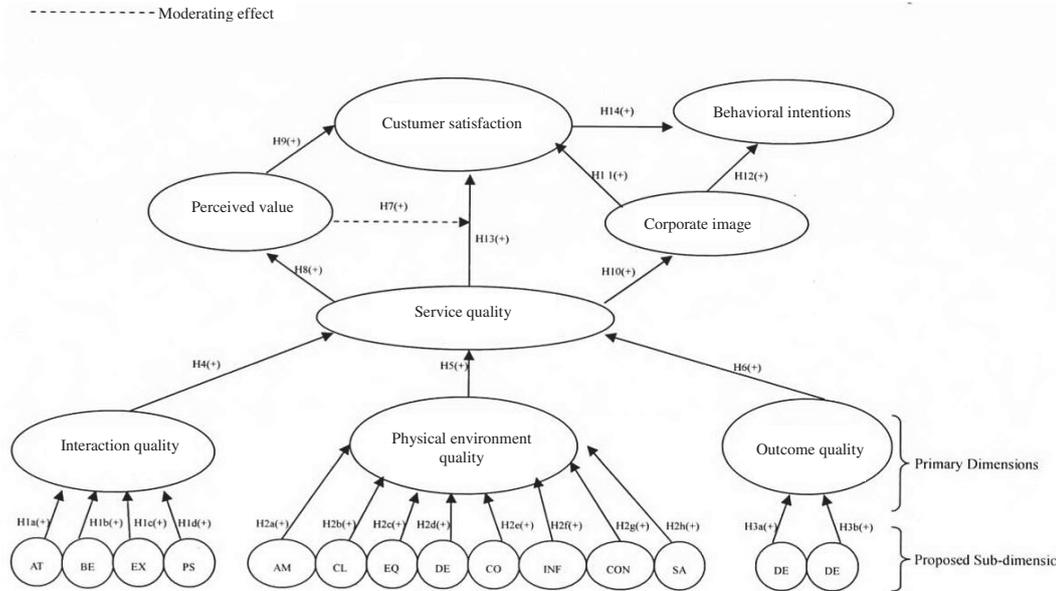
Table 4. Summary of regression models

Model	Dependent variable	Independent variable (s)	Adjusted R ²	F value	Standardized coefficients	t value
1	Interaction quality	Employees' conduct Employees' expertise Employees' problem-solving	0.607	273.224***	-0.015 0.232 0.595	-0.231 3.790*** 11.671***
2	Physical environment quality	Cleanliness Availability of facility Information Ambience & design Convenience	0.548	128.893***	0.265 0.130 0.101 0.358 0.119	6.767*** 4.301*** 2.468*** 8.067*** 3.427***
3	Outcome quality	Valence Waiting time	0.685	575.292***	0.588 0.278	14.389*** 6.804***
4	Service quality	Interaction quality Physical environment quality Outcome quality	0.701	414.214***	0.138 0.300 0.525	4.503*** 9.991*** 15.293***
5	Customer satisfaction	Step one Service quality Perceived value Step two Service quality x perceived value	0.782 0.750	946.351*** 1588.243***	0.189 0.730 0.867	5.891*** 22.780*** 39.853***

Table 4 (cont.). Summary of regression models

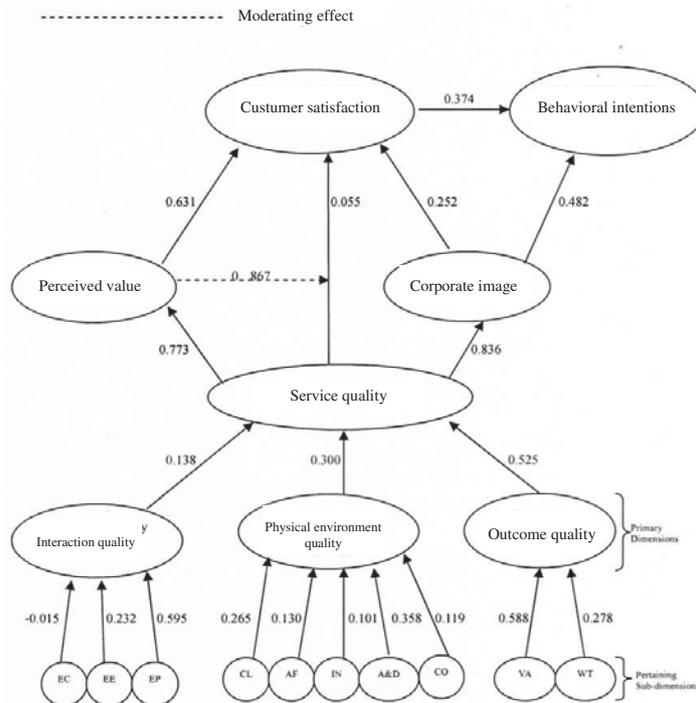
Model	Dependent variable	Independent variable (s)	Adjusted R ²	F value	Standardized coefficients	t value
6	Perceived value	Service quality	0.597	783.437***	0.773	27.990***
7	Corporate image	Service quality	0.699	1225.063***	0.836	35.001***
8	Customer satisfaction	Perceived value Corporate image Service quality	0.798	689.721***	0.631 0.252 0.055	18.159*** 6.258*** 1.464
9	Behavioral intentions	Corporate image Customer satisfaction	0.662	517.455***	0.482 0.374	11.258*** 8.747***

Notes: *** significant at 1% level; ** significant at 5% level; * significant at 10% level.



Note: AT = Attitude, BE = Behavior, EX = Expertise, PS = Problem-solving, AM = Ambience, CL = Cleanliness, EQ = Equipment, DE = Design, CO = Convenience, INF = Information, CON = Convenience, SA = Safety, VA = Valence, WT = Waiting time.

Fig. 1. Behavioral intentions in the transport industry: a conceptual research model



Note: EC = Employees' conduct, EE = Employees' expertise, EP = Employees' problem-solving, CL = Cleanliness, AF = Availability of facility, IN = Information, A & D = Ambience & design, CO = Convenience, VA = Valence, WT = Waiting time.

Fig. 2. Behavioral intentions of surveyed passengers in the transport industry: path model