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Ride-Hailing Applications in Bangkok: Determining Service Quality, Passenger Satisfaction, and Loyalty

Phathinan Thaithatkul[1], Ornicha Anuchitchanchai[1*], Punyaanek Srisurin[1], Patanapong Sanghatawatana[1], Saksith Chalermpong[1,2]

[1]*Transportation Institute, Chulalongkorn University, 254 Phayathai Rd, Wang Mai, Pathum Wan District, Bangkok 10330, Thailand*
[2]*Faculty of Engineering, Chulalongkorn University, 254 Phayathai Rd, Wang Mai, Pathum Wan District, Bangkok 10330, Thailand*

Abstract. The objective of this study is to investigate the main factors influencing the loyalty and satisfaction of ride-hailing application (RHA) users using the service quality model and structural equation model (SEM). The loyalty and satisfaction of experienced RHA users were examined with a set of explanatory variables, such as platform responsiveness and attitudes toward an RHA. Online survey data were collected from 310 respondents in Bangkok and analyzed. The findings showed that user perceptions of an RHA's high competence and empathy and users' positive attitudes toward an RHA significantly influenced their satisfaction. The results also indicated that only structural assurance and empathy affected customer loyalty. Our findings suggest that training RHA riders for competence and empathy to improve customers' offline service can also improve customer satisfaction. In addition to offline service, RHA providers should focus on the structural assurance of the platform.

Keywords: Customer satisfaction; Loyalty; Ride-hailing services; SERVQUAL; Structural equation model

1. Introduction

The advancement of information technology, especially the mobile internet, has recently become a main driver in changing the way people live. Ride-hailing applications (RHAs) have burgeoned in many regions around the world, including Southeast Asia (Brail, 2020), disrupting urban transportation systems. Similar to taxi services, travelers can hail vehicles from anywhere at any time via applications on their mobile phones. Since the first introduction of an RHA by UberCab in the United States in 2009, the market value of RHAs has risen exponentially to over 113 billion US dollars in 2020 (Mordor Intelligence, 2021). RHAs tend to not only improve the mobility of passengers in terms of convenience, accessibility, and reliability but also offer cheaper costs of transportation (Clewlow and Mishra, 2017). As a result, RHAs have become one of the main transportation modes of travel, especially in urban areas (Tirachini, 2019).

Bangkok is the sprawling capital city of Thailand, located in the middle region of the country. Typically, the main public transportation modes in the city are fixed bus routes and

*Corresponding author's email: ornicha.a@chula.ac.th, Tel.: +662-218-7449; Fax: +662-218-7446
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and mass rapid transit (the sky train and subway). However, present service routes do not cover the entire area of Bangkok (Amrapala and Choocharukul, 2019). Therefore, RHAs in Bangkok have the capacity to offer residents greater mobility for commuting and non-commuting trips (e.g., shopping, leisure, business trips, etc.) (Laosinwattana et al., 2021). The number of RHA users has continuously increased as new major RHA companies, such as Grab and Line Taxi, have been introduced (Conc, 2019). Prior to the COVID-19 pandemic, conventional taxi drivers in Bangkok were notorious for frequently rejecting passengers on the street (Peungnumsai et al., 2017). For this reason, RHAs offer a useful alternative for many customers to secure rides. The reliability of RHAs is one of its key advantages in gaining a large market share of Bangkok transit modes and steadily gaining customer loyalty and satisfaction.

The aim of this research is to investigate the main factors that influence customer loyalty and satisfaction by applying the service quality model (SERVQUAL) framework (Parasuraman et al., 1988; Cheng et al., 2018). The loyalty and satisfaction of experienced RHA users were examined with a set of explanatory variables, such as platform responsiveness and attitudes toward RHAs. Ultimately, these factors are of interest to both policy makers and service providers who aim to improve RHAs' service quality and maintain customers' loyalty.

2. Literature Review

2.1. SERVQUAL Model

Service quality can be understood as a comparison between the expected and actual experiences of consumers. Service quality has been widely studied by employing SERVQUAL, a conceptual framework for quantitatively assessing service quality using the structural equation modeling (SEM) approach (Parasuraman et al., 1988; Buttle, 1996). Service quality was initially assessed by applying 10 components: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding the customer, and tangibles (Parasuraman et al., 1985). These were later reduced to five components: reliability, assurance, tangibles, empathy, and responsiveness (Parasuraman et al., 1988). Assurance and empathy are the reduced forms of the seven excluded components. Since it was first introduced, the SERVQUAL framework has been used in various fields, such as retail, transportation, and health services.

After online shopping was introduced, the concept of assessing the electronic service quality of online platforms, the so-called E-S-QUAL, subsequently emerged. This concept was based on four components: efficiency, fulfillment, system availability, and privacy (Parasuraman et al., 2005). Collier and Bienstock (2006) extended the framework of the E-S-QUAL by introducing three main dimensions: the process dimension (i.e., functionality, information accuracy, design, privacy, ease of use), the outcome dimension (i.e., order accuracy, order condition, timeliness), and the recovery dimension (i.e., interactive, procedural, outcome fairness) (Collier and Bienstock, 2006). A comprehensive review of the E-S-QUAL can be found in Barrutia and Gilsanz (2009).

Cheng et al. (2018) later adapted the model for assessing the service quality of online ride-hailing platforms. This model consisted of two dimensions: the online dimension (i.e., structural assurance, platform responsiveness) and the offline dimension (i.e., information congruity, competence, empathy). In their study, the influence of service quality and satisfaction on user loyalty was also investigated.

2.2. *Service Quality of and Satisfaction with RHAs*

Silalahi et al. (2017) used the information system success model to assess online service quality aspects of motorcycle-based RHAs in Indonesia. This model was originally developed by Delone and McLean (2003) and was composed of three quality dimensions: service quality, information quality, and system quality. In Silalahi et al.'s (2017) study, these three dimensions were assessed by 20 measurement items. Using the entropy technique, the highest weight of service quality was perceived as cognitive. Content usefulness and ease of use were found to be the highest weighted items for information quality and system quality, respectively.

Kuswanto et al. (2019) assessed both online and offline service quality aspects of motorcycle-based RHAs in Indonesia. Online service quality was assessed by the information system success model, while offline service quality was assessed by the SERVQUAL model (Parasuraman et al., 1988). Even though both offline and online service quality were found to significantly influence satisfaction with motorcycle-based RHAs, offline service quality had stronger effects on satisfaction than online service quality.

Similarly, Cheng et al. (2018) assessed both online and offline service quality aspects of car-based RHAs in China by using their extended SERVQUAL model. Even though Cheng et al. (2018) focused on car-based RHAs and did not use the same analysis framework as Kusawanto et al. (2019), their findings conformed with those of Kusawanto et al. (2019). Moreover, they found that attitudes toward RHAs moderated the relationship between service quality and loyalty.

Tansitpong (2019) adopted the SERVQUAL model (Parasuraman et al., 1988) to compare service quality and satisfaction between a car-based RHA (i.e., Uber) and regular taxis in Bangkok, Thailand. The results showed that satisfaction with Uber and regular taxis was both positively influenced by tangibles and reliability. However, satisfaction with Uber was also influenced by responsiveness, while satisfaction with regular taxis was additionally influenced by assurance and trust. Moreover, the findings suggest that Uber provided better service quality than regular taxis in terms of tangibles and responsiveness.

Even though Tansitpong (2019) represents an existing study on service quality and satisfaction of RHAs in Bangkok, the study only considered the offline service quality provided by RHA drivers but not crucial aspects of online service quality. Moreover, the study was conducted when Uber operated its service in Bangkok. However, the RHA market has changed substantially in the last few years, and since then, Uber has withdrawn its service from Southeast Asia and was bought by Grab in Thailand. Therefore, the current study aims to assess both online and offline service quality aspects and investigate their effects on satisfaction and loyalty of RHAs in Bangkok.

3. Methodology

3.1. *Study Area*

The study area of this research was determined in order to collect data from target respondents—those who frequently traveled to the designated area via work trips. The study area thus comprised four square kilometers in central Bangkok. This included parts of the Ratchatewi and Phayathai districts, which cover numerous private offices and government agencies as well as several points of interest, such as Mahidol University, major hospitals, and shopping malls. Fixed route public transit services in the area include 34 bus routes and four transit stations of the Bangkok Mass Transit System elevated heavy rail line. In addition, there are various on-demand public transportation services, including taxis, motorcycle taxis, motor tricycles (*tuktuk*), and RHAs, that serve passengers in this area.

During the study period, there were five main RHA providers in Bangkok: Grab, Line Taxi, Gojek, and Muvmi. Grab dominated the RHA market in Bangkok because of its variety of services. In addition to taxi and motorcycle taxi services, Grab also provided private car and motorcycle hailing services regardless of the legality. Line Taxi only provided a taxi hailing service, and Gojek only had a motorcycle taxi hailing service. However, Gojek withdrew its services from Bangkok's RHA market in mid-2021. Muvmi, a local Thai platform, provided electric motor-tricycle hailing and ride-sharing services in limited areas in Bangkok.

3.2. Data Collection

The survey data were collected from 359 survey participants who frequently traveled to the study area via work trips from July 8, 2021 to August 4, 2021. This number of participants is sufficient for SEM analysis (Jackson, 2001; Ardi et al., 2020). The survey data were collected online through Google Forms. The quota sampling approach was adopted for collecting the number of data points based on the 80:20 proportion of commuters (government agency employees and college students in the study area) and non-commuters who traveled to the area. The survey method and questionnaire were approved by the Institutional Review Board of Chulalongkorn University prior to being distributed to participants in the study area.

The questionnaire was divided into two parts: (1) measurement items for assessing service quality aspects; and (2) sociodemographic and socioeconomic characteristics. Measurement items from Cheng et al. (2018) were used for developing the questionnaire. All measurement items are listed in Table 1. Each measurement item adopted a 5-point Likert scale ranging from "1 = strongly disagree" to "5 = strongly agree." The second part of the questionnaire contained questions about age, gender, education attainment, and personal monthly income. Responses to most questions were coded as categorical variables, except for age, which was coded as a continuous variable.

3.3. Structural Equation Model (SEM)

There are two types of variables in SEM analysis. First, latent variables are variables that cannot be directly observed (Salkind, 2010). However, their effects can be measured by other types of variables: observed variables or indicators. Therefore, SEM is composed of two parts: the measurement model and the structural model (Yin and Huang, 2021). The measurement model is the model used to determine the relationship between indicators and latent variables, while the latter is used to determine the relationship among latent variables and among indicators. Furthermore, it is used to quantify relationships between factors and observed variables (Muthén and Muthén, 2017; Yin and Huang, 2021). Therefore, it is essential that SEM analysis include both models.

The steps of SEM analysis can be summarized as follows. First, outliers are identified in the data screening phase (Rafique et al., 2020). This step can be performed by the Mahalanobis distance D2 test. Next, the problems of multicollinearity among independent variables are evaluated by the variance inflation factor. Third, since observed variables are often obtained from questionnaire surveys, it is necessary to confirm the internal consistency of questions (indicators) within the same construct, as determined by Cronbach's alpha. This step is performed to ensure that all indicators within the same latent variable or same construct are sufficiently consistent and reliable, as indicated by a Cronbach's alpha of greater than 0.7 (Kline, 2005).

Table 1 Measurement items

Component	Variable	Measurement items
Structural assurance (SA)	SA1	The mobile platform provides enough safeguards to make me feel comfortable for hailing a ride on the platform.
	SA2	I feel assured that legal structures adequately protect me from problems on the platform.
	SA3	I feel confident that encryption and other technological advances on the platform make it safe for me to conduct online transactions there.
	SA4	In general, the platform is now a robust and safe environment for online transactions.
Platform responsiveness (PR)	PR1	The platform is always quick to respond to my inquiries.
	PR2	I often encounter online errors when searching for a ride service.
	PR3	The platform didn't respond to my inquiry promptly.
Information congruity (IC)	IC1	The goods and services usually conform to what were shown on the mobile platform.
	IC2	I usually find inconsistencies between the information shown online and displayed offline.
	IC3	The offline goods and services are always in line with the descriptions online.
Competence (Com)	Com1	In general, most drivers on the platform are competent at serving their customers.
	Com2	I always feel confident that I can rely on drivers to finish their part of the ride.
	Com3	I feel that most internet-based drivers are good at what they do.
	Com4	I always feel comfortable relying on drivers to arrive at my destination.
Empathy (Emp)	Emp1	I feel that most drivers will act in a customers' best interest.
	Emp2	If a customer requires help, most drivers will do their best to help.
	Emp3	Most drivers are interested in customers' well-being, not just their own well-being.
Attitude toward RHA (Att)*	Att1	The idea of using this platform to take a car is appealing.
	Att2	Using this platform to reserve or share car services would be a good idea.
	Att3	I have good attitudes toward hailing a ride on the platform.
	Att4	Hailing a ride on the platform makes me look cool.
	Att5	I like the idea of hailing through the digital platforms.
Satisfaction (Stf)	Stf1	I think that I made the correct decision to use this platform.
	Stf2	In general, I am satisfied with the customer service I have received from the platform.
	Stf3	The platform satisfied my need to take a car.
Loyalty (Loy)	Loy1	I intend to continue using this certain platform in the future and would keep using this platform as regularly as I do now.
	Loy2	When new types of mobile apps emerge, I will continue to select this certain platform.
	Loy3	I will strongly recommend that others use this certain platform.

Measurement items developed by Cheng et al. (2018) were modified (*) and adopted.

Once all the assumptions are confirmed, the measurement model is performed using confirmatory factor analysis to observe the reliability of the model. For good model constructs, observed variables should be related to each other within the same construct or group of latent variables. In contrast, they should be unrelated to indicators from different constructs. The first condition is called convergent validity while the latter is called discriminant validity. Convergent validity can be judged by construct reliability (CR), which should be greater than 0.7. In addition, CR should be greater than the average variance extraction (AVE). The AVE, in turn, should be greater than 0.5; otherwise, the variance of measurement error is larger than variance captured by the construct. If so, the model is not convergent valid (Fornell and Larcker, 1981). For discriminant validity test, the AVE must be greater than maximum shared variance or squared correlation. Once the measurement model test is confirmed, SEM analysis can be performed.

3.4. Conceptual Relationship

This study adopted the conceptual framework of extended SERVQUAL as proposed by Cheng et al. (2018). Five components of service quality in both online aspects (i.e., structural assurance and platform responsiveness) and offline aspects (i.e., information

congruity, competence, and empathy) were hypothesized to directly influence satisfaction and loyalty. Furthermore, the positive relationship of satisfaction toward loyalty has been revealed in various recent studies, including in the ride-hailing literature (Cheng et al., 2018; Nguyen-Phuoc et al., 2020). Attitudes also played an important role in promoting satisfaction and loyalty among RHA users. In other words, positive attitudes toward the services may affect self-motivation and positively influence user satisfaction and loyalty. The conceptual model used in this study is shown in Figure 1.

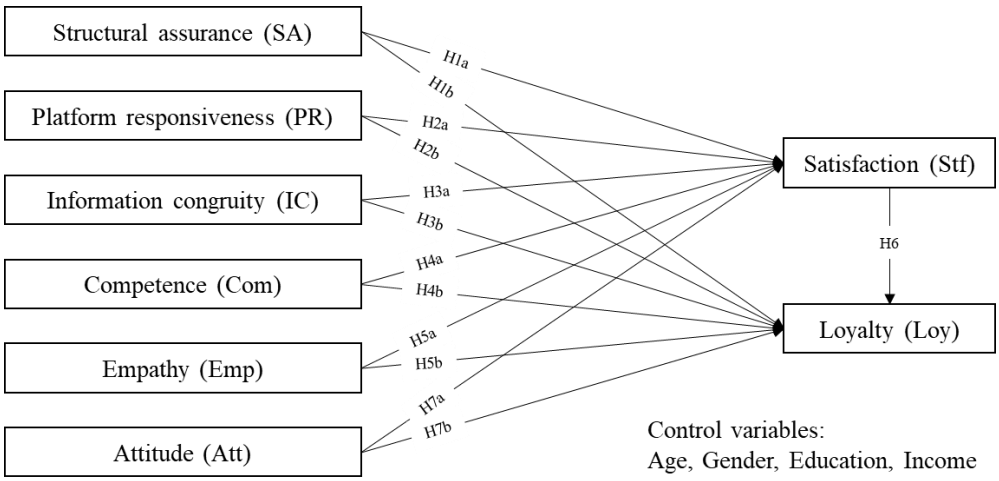

Figure 1 Conceptual relationship and research hypotheses

H1. Structural assurance positively influences: (a) satisfaction; and (b) loyalty, such that satisfaction and loyalty will be higher for users who perceive a higher level of structural assurance.

H2. Platform responsiveness positively influences: (a) satisfaction; and (b) loyalty, such that satisfaction and loyalty will be higher for users who perceive a higher level of platform responsiveness.

H3. Information congruity positively influences: (a) satisfaction; and (b) loyalty, such that satisfaction and loyalty will be higher for users who perceive a higher level of information congruity.

H4. Competence positively influences: (a) satisfaction; and (b) loyalty, such that satisfaction and loyalty will be higher for users who perceive a higher level of competence.

H5. Empathy positively influences: (a) satisfaction; and (b) loyalty, such that satisfaction and loyalty will be higher for users who perceive a higher level of empathy.

H6. Satisfaction positively influences loyalty, such that loyalty will be higher for users who perceive a higher level of satisfaction.

H7. Attitudes toward an RHA positively influence: (a) satisfaction; and (b) loyalty, such that satisfaction and loyalty will be higher for users who perceive more positive attitudes toward the RHA.

4. Results

4.1. Descriptive Statistics

The original survey sample was analyzed to identify outliers using Mahalanobis distance with a 95% confidence level. After removing 49 outliers from 359 observations, 310 observations were used for further analysis. The descriptive statistics are shown in Table 2. Our sample consisted largely of young adults with an average age of 27.42 years. The majority of the sample were female (64%) and well educated (75%). Income

distribution was quite even in the sample. The characteristics in terms of age, gender, and education conformed to the findings from previous studies (Nistal and Regidor, 2016; Weng et al., 2017; Tirachini, 2019; Nguyen-Phuoc et al., 2020).

Table 2 Descriptive statistics of respondents

Variable	Category	n	%
Samples	-	310	100.00%
Age (mean = 27.42, std = 8.46)	17–24 years	169	54.52%
	25–29 years	59	19.03%
	30–39 years	47	15.16%
	40–49 years	24	7.74%
	50–59 years	11	3.55%
Gender	Female (reference)	197	63.55%
	Male	110	35.48%
	NA	3	0.97%
Education	High school or lower	68	21.94%
	Bachelor's degree (reference)	187	60.32%
	Master's degree or higher	48	15.48%
	NA	7	2.26%
Personal income	≤ 15,000 (reference)	134	43.23%
	15,001–30,000	93	30.00%
	> 30,000	66	21.29%
	NA	17	5.48%

4.2. Measurements

SPSS 22 and Amos Graphics 22 were used for performing data analysis. Based on our sample, Cronbach's alpha and CR were used for testing the internal consistency reliability of latent constructs and their measurement items with a threshold value of 0.7 (Kline, 2005). Next, the latent constructs were tested for convergent validity. Measurement items with loading factors lower than 0.6 were removed, as shown in Table 3 (Mohamad et al., 2014).

Table 3 Results of measurement model evaluation

Latent variables	Indicators	Loadings	Cronbach's α	CR	AVE
Structural assurance (SA)	SA1	0.633	0.829	0.84	0.641
	SA3	0.826			
	SA4	0.918			
Platform responsiveness (PR)	PR2	0.827	0.746	0.752	0.603
	PR3	0.722			
Information congruity (IC)	IC1	0.849	0.720	0.731	0.58
	IC3	0.663			
Competence (Com)	Com1	0.764	0.876	0.879	0.645
	Com2	0.828			
	Com3	0.749			
	Com4	0.867			
Empathy (Emp)	Emp1	0.804	0.860	0.861	0.674
	Emp2	0.856			
	Emp3	0.801			
Attitude (Att)	Att1	0.876	0.914	0.917	0.735
	Att2	0.908			
	Att3	0.873			
	Att5	0.765			
Satisfaction (Stf)	Stf2	0.861	0.862	0.863	0.759
	Stf3	0.882			
Loyalty (Loy)	Loy1	0.779	0.714	0.716	0.558
	Loy3	0.714			

As a result, all latent variables were explained by at least two measurement items with factor loadings ranging from 0.633 to 0.918. The AVE of all latent constructs was higher than 0.5, indicating that the measurement items of the same construct were positively correlated (Fornell and Larcker, 1981). Discriminant validity was also evaluated. For all latent constructs, all the correlations among variables were smaller than their square root of the AVE, indicating a distinction between constructs (Fornell and Larcker, 1981), as shown in Table 4. For example, regarding the discriminant between SA and PR, the square root of the AVE of SA equals 0.800, and the square root of the AVE of PR equals 0.777, both of which are greater than the correlation between SA and PR (i.e., 0.044).

Table 4 Correlations of the constructs

	SA	PR	IC	Com	Emp	Att	Stf	Loy
SA	**0.801**							
PR	0.044	**0.777**						
IC	0.423	0.225	**0.761**					
Com	0.597	0.199	0.599	**0.803**				
Emp	0.502	-0.079	0.484	0.632	**0.821**			
Att	0.539	0.270	0.584	0.715	0.496	**0.857**		
Stf	0.494	0.253	0.622	0.744	0.615	0.793	**0.871**	
Loy	0.529	0.218	0.410	0.624	0.587	0.675	0.745	**0.747**

4.3. Structural Model Evaluation

Table 5 shows the recommended value of fit indices and the model's fit indices. Among seven fit indices, six satisfied the recommended threshold. Even though the adjusted goodness of fit index (AGFI) did not satisfy the recommended value from a recent study, it was higher than 0.8 and is thus still acceptable (Doll et al., 1994; Baumgartner and Homburg, 1996). The estimation result is shown in Table 6. Note that the N/A responses were the major category of the variable (i.e., female, bachelor's degree, 15,000 THB of monthly personal income or less).

Competency (Com) and empathy (Emp), the latent variables of offline service quality, significantly affected the level of satisfaction but not the information congruity. Moreover, empathy had a stronger effect on satisfaction than competency. This finding was different from a previous study in Bangkok, where empathy was not found to significantly affect satisfaction (Tansitpong, 2019). In contrast with previous studies (Cheng et al., 2018; Kuswanto et al., 2019), neither of these latent variables related to *online* service quality (i.e., SA and PR) significantly affected customer satisfaction. This finding suggested that passengers give more precedence to the offline experience than the online experience.

Still, this finding aligns with previous research, which found that offline service quality has a stronger effect on satisfaction than online service quality (Cheng et al., 2018; Kuswanto et al., 2019). This could be due to the non-competitive market of RHA providers, as described in Section 3.3. In addition, the effects of empathy and satisfaction were found to significantly influence loyalty. Moreover, structural assurance was found to significantly influence loyalty, conforming to the findings of Surjandari et al. (2019). Lastly, in addition to the service quality measuring variables, attitudes toward RHAs were found to significantly affect satisfaction but not loyalty. This result suggests that individuals with positive attitudes toward an RHA are likely to welcome any RHA.

Considering the mediation role of satisfaction between service quality constructs and loyalty, partial mediations exist from empathy to satisfaction and loyalty. Indirect effects were found from competence to satisfaction and loyalty, while only a direct effect was found

from platform responsiveness to loyalty. For attitude toward RHAs, we found full mediations from attitude to satisfaction and loyalty.

Table 5 SEM goodness of fit statistics

Fit indices	Value	Recommended cutoff	Citation
χ^2/df	1.647	< 2	(Tabachnick and Fidell, 2007)
CFI	0.961	≥ 0.95	(Hu and Bentler, 1999)
RMSEA	0.046	≤ 0.06	(Hu and Bentler, 1999)
GFI	0.911	≥ 0.90	(Rafique et al., 2020)
AGFI	0.864	≥ 0.90	(Rafique et al., 2020)
NFI	0.910	≥ 0.90	(Bentler and Bonett, 1980)
TLI	0.945	≥ 0.90	(Rafique et al., 2020)

Table 6 SEM estimation and hypotheses testing results

Hypothesis	Casual path	Coefficient	p-value	Support
H1a	SA → Stf	-0.079	0.101	No
H1b	SA → Loy	0.124	0.048	Yes
H2a	PR → Stf	0.063	0.143	No
H2b	PR → Loy	0.087	0.116	No
H3a	IC → Stf	0.119	0.093	No
H3b	IC → Loy	-0.168	0.068	No
H4a	Com → Stf	0.198	0.007	Yes
H4b	Com → Loy	0.007	0.940	No
H5a	Emp → Stf	0.250	<0.001	Yes
H5b	Emp → Loy	0.214	0.024	Yes
H6	Stf → Loy	0.484	<0.001	Yes
H7a	Att → Stf	0.502	<0.001	Yes
H7b	Att → Loy	0.147	0.195	No

5. Conclusions

This paper examined the influence of RHA service quality on users' satisfaction and loyalty. A framework of SERVQUAL and an SEM for assessing service quality were applied in this study. Online survey data collected from 310 respondents in Bangkok were analyzed. The findings showed that perceiving good competence and empathy (i.e., offline service quality constructs) and positive attitudes toward an RHA significantly influenced the satisfaction of RHA users. The results also indicated that only structural assurance (i.e., online service quality construct) and empathy (i.e., offline service quality construct) had an influence on customer loyalty. Our findings suggest that, in order to increase customer satisfaction, RHA providers should emphasize driver training, as trained drivers could provide customers with a better offline customer experience. To achieve customer loyalty, RHA providers should also focus on the platform's structural assurance in addition to offline customer service. Even though structural assurance was found to only influence loyalty but not satisfaction, it is essential to regulate data protection and user privacy to ensure consumer protection in the digital era.

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