

Contactless Service in Hospitality: Bridging Customer Equity, Experience, Delight, Satisfaction, and Trust

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Declaration of Interests

There are no conflicts of interest to declare.

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Abstract

Purpose. This study draws from the equity theory and customer equity literature to argue that the implementation of contactless service as an innovative service design in the hospitality industry can generate customers' emotional attachment and cognitive evaluation of the brand.

Methodology. This study uses partial least squares modeling and data from a large-scale survey of hotel guests who have experienced contactless service in mainland China. We performed an importance-performance map analysis to evaluate the significance of critical variables and constructs by including the performance dimension.

Findings. Customer equity is a three-dimensional higher-order construct that embraces value-, brand-, and relationship equity. A pleasant experience of contactless service in hospitality encounters generates a positive effect on customer equity and delight. Additionally, increased customer equity improves satisfaction and trust.

Originality. The findings of this study add to the understanding of emerging contactless services, contribute to the development of the equity theory and current customer equity literature, and advance the implementation of innovative service design in hospitality.

Social and Practical Implications. Our study provides practical evidence for hospitality practitioners to consider contactless service in creating memorable experiences, improve customer satisfaction, build trust, and add value to hospitality brands.

Keywords: customer equity, contactless service, service design, technology, equity theory, COVID-19 pandemic

Article classification: Original empirical research article

Introduction

COVID-19 has put the hospitality industry on the path to a high-tech and low-touch future. The most significant changes caused by the pandemic in hospitality are customers' concerns for social distancing, hygiene, health, and sustainability (Hao *et al.*, 2020). These changes will continue in the post-pandemic era and become the hospitality industry's "new normal." As part of the "new normal," contactless service, which is technology-enabled, touchless, and adaptable, has emerged as an innovative service design during the pandemic (Min, 2020). This allows hospitality firms to create the safest possible guest and staff experience, while maintaining high-quality service (Hao *et al.*, 2020; Kim *et al.*, 2021).

In this study, contactless hospitality service is defined as *a contactless and fully disinfected service procedure and environment utilizing a combined package of self-service, robotic services, and internet of things (IoT)-based implements*. Contactless service is designed to reduce COVID-19 virus transmission by avoiding human-to-human contact and reducing surface contact in public areas. Personal contact is substituted with robotic reception, self-check-ins, guest room voice control, robotic delivery, and robotic concierge services (Zeng *et al.*, 2020). Due to the pandemic, many hospitality firms are currently attempting to assemble contactless technology to deliver a seamless contactless service to their customers. Contactless service is designed to cover major touchpoints across different phases of a customer's journey (Serrano and Kazda, 2020). Figure 1 shows how contactless touchpoints are implemented in the lodging sector across several phases of the customer journey.

[Insert Figure 1 near here]

Contactless service is not an invention instigated by the pandemic because many contactless technological modules (e.g. contactless payment, facial recognition, and keyless access) already existed before COVID-19; however, the pandemic has accelerated their implementation worldwide. That said, a key concern for hospitality practitioners is the unknown return on investment (ROI) for contactless service (Hotel News Now, 2020). Therefore, the potential ROI of contactless service requires careful analysis due to its cost.

Customer equity is an important aspect of return for marketing investments (Blattberg and Deighton, 1996). Recently, several studies have analyzed customer equity in the field of business, service, and marketing (Gao *et al.*, 2020; Ho and Chung, 2020; Ou and Verhoef, 2017; Kim *et al.*, 2020). The business world is gradually organizing itself around customers

rather than products, and the service industry is evolving from brand-centered to customer-centered marketing (Bell *et al.*, 2002; Zeithaml *et al.*, 2001). This change in customer focus calls for a new paradigm that shifts the focus from brand equity to customer equity. Customer equity is based on the philosophy that customers are the main source of current and future cash flows. Therefore, customer equity is utilized as a powerful tool to maximize the return on marketing investments and to optimize the allocation of the marketing budget (Villanueva and Hanssens, 2007).

Despite the growing popularity of contactless service in the hospitality industry and the increasing demand to examine its ROI in the academic world, to the authors' best knowledge, very few studies have empirically researched contactless hospitality service (Kim *et al.*, 2021), and no study has examined its ROI to provide empirical insights for effective management and marketing programs. To fill this gap, this study investigates the ROI of contactless service from the customer equity perspective. Specifically, the aim of this study is three-fold. First, this study proposes a customer equity model of its drivers and consequences and verifies it empirically in a hotel setting. Second, we explore the impact of customers' experience of contactless service on delight and customer equity, considering three dimensions of customer equity: value equity, brand equity, and relationship equity. Finally, this study considers the influence of customer equity on the satisfaction and trust of hotels equipped with contactless service. The findings of this study add to the understanding of emerging contactless service, contribute to the development of equity theory and current customer equity literature, and advance the implementation of innovative service design in the hospitality industry. Moreover, this study provides practical evidence for hospitality practitioners to consider contactless service as a way to create memorable experiences, improve satisfaction, build trust, and add value to customers.

Theoretical considerations and hypotheses

Customer equity

The shift from brand equity to customer equity indicates the transfer of focus from goods to services, from a product orientation to customer orientation, from transactions to relationships, and from customer attraction to customer retention (Zeithaml *et al.*, 2001). Customer equity is an important aspect of ROI. It plays a significant role in allocating marketing expenditure toward the objectives of sustainable profitability, exploring the relationship between marketing spending and metrics, assessing firm value with a customer-

focused approach, and improving the productivity of customer relationship management (CRM) platforms.

The concept of customer equity is derived from the equity theory developed by Adams (1963). It considers the nature of inputs and outcomes in a service encounter, the nature and course of social comparisons, and the causes and possible consequences of equitable or inequitable situations (Pritchard, 1969). Due to its subjective nature, equity theory is flawed for making macroeconomic policies (Pereira *et al.*, 2017); however, it is effective in assessing financial compensation on the microeconomic level in organizational management and customer behavior studies (Gao *et al.*, 2020; Ho and Chung, 2020; Kim *et al.*, 2020).

Researchers have analyzed customer equity from two perspectives: information economics and cognitive psychology. Information economics is an organization-oriented evaluation of customer equity that supports organization-level CRM investment decisions. From the information economics perspective, Villanueva and Hanssens (2007, p. 8) defined customer equity as “the sum of the discounted stream of cash flows generated from a company’s pool of customers.” Blattberg and Deighton (1996) considered customer equity as the optimal balance between investment in customer acquisition and customer retention. From this point of view, customer equity, with acquisition, retention, and add-on selling as major components, is measured by customer lifetime value with the aid of various economic models (Rust *et al.*, 2004).

This study explores customer equity from a cognitive psychology perspective, which is a customer-oriented assessment of the value of a product or service, brand, and company-customer relationship. Customer equity can not only positively predict satisfaction and intent to return or recommend (Kim *et al.*, 2020), but also effectively improve experience quality, and eventually promote profitability (Gao *et al.*, 2020; Ho and Chung, 2020; Vogel *et al.*, 2008). Following the studies of Gao *et al.* (2020); Ho and Chung (2020); Ou and Verhoef (2017); Vogel *et al.* (2008); Zeithaml *et al.* (2001), we conceptualize customer equity as a three-dimensional secondary order construct that comprises *value equity*, *brand equity*, and *relationship equity*.

Value equity is defined as a customer’s objective evaluation of the usefulness of a brand, considering what is given up for what is received (Lemon *et al.*, 2001). Brand strategy and customer retention would be meaningless without desirable products and satisfactory services. Quality, price, and convenience are the three major determinants of value equity. The value equity of hospitality services can be increased through active value co-creation and dynamic customer engagement (Buhalis and Sinarta, 2019).

Brand equity depicts the overall utility that customers place in a brand compared to its competitors (Boo *et al.*, 2009). It indicates the power that a brand commands in a market through its name, terminology, sign, symbol, or design, rather than from the product or service itself (Farquhar, 1989; Sürücü *et al.*, 2019). Keller (1993) noted that customer-based brand equity embraces two components: brand awareness and brand image. When customers are more familiar with the brand and have more favorable, intense, and unique brand associations in mind, they may generate higher brand equity.

Relationship equity indicates the “tendency of the customer to stick with the brand, above and beyond the customer’s objective and subjective assessments of the brand” (Lemon *et al.*, 2001, p. 2). It explores the methods to tie customers to the firm and strengthen the stickiness of the relationship. Firms can improve relationship equity using various engagement schemes, such as loyalty, affinity, community co-creation, and knowledge-building schemes. By so doing, the benign relationship is cultivated and maintained through a long-lasting service relationship beyond the transactional motive of immediate purchase, and thereby fostering deep psychological commitment and active behavioral involvement between customers and a firm (Hao, 2020).

In hospitality settings, customer equity is an important parameter for assessing business success (Wu and Li, 2011). Studies have looked at hospitality sectors, including lodging (Lee and Park, 2019; Sürücü *et al.*, 2019; Wu and Li, 2011), dining (Hyun, 2009), gambling (Wong, 2013), and events (Severt and Palakurthi, 2008). Meticulous attention to customer equity contributes to a comprehensive, sustainable, and profitable hospitality business model (Altınay and Taheri, 2019). It is an effective tool to enhance satisfaction and loyalty (Lee and Park, 2019). Notably, Sürücü *et al.* (2019) considered brand awareness, physical quality, staff behavior, and brand image as sub-dimensions of customer equity.

There are three gaps in customer equity research. (1) The existing studies examine customer equity in general service encounters, but there is scant research into the impact of specific service innovation on customer equity. (2) In line with the mainstream marketing and business studies, some hospitality researchers perceive value-, brand-, and relationship-equity as major determinants of customer equity (Hyun, 2009; Severt and Palakurthi, 2008). However, except for Lee and Park (2019), no study has considered customer equity as a higher-order, three-dimensional construct. Even in Lee and Park's (2019) study, there is no specific report on higher-order constructs. (3) As most research predominantly focused on either the dimensions (Hyun, 2009; Severt and Palakurthi, 2008) or consequences (Sürücü *et al.*, 2019) of customer equity, Wong (2013) and Lee and Park (2019) have called for more research to

place customer equity in a holistic nomological net that takes its antecedents, dimensions, and consequences into integrated consideration. To fill in these research gaps, we explore the influence of contactless hospitality service on higher-order customer equity in the hotel sector, with experience and delight as antecedents, and satisfaction and trust as consequences.

Experience of contactless service, customer delight, and customer equity

In the hospitality industry, contactless service entails a touchless and disinfected service procedure within an environment offering a combination of self-service, robotic services, and IoT-based technology (Hao *et al.*, 2020). The experience of contactless service has the potential to generate customer delight—a blend of joy and surprise derived from unexpected and positive performance levels (Crotts and Magnini, 2011; Finn, 2005). Therefore, we propose:

Hypothesis 1: Customers' experience of contactless service has a significant positive effect on delight.

Further, pleasant sensory, affective, intellectual, and behavioral experiences positively influence customer equity and brand equity in the service industry (González-Mansilla *et al.*, 2019; Iglesias *et al.*, 2019; Nam *et al.*, 2011). Based on the equity theory and the spillover effect explained by Balachander and Ghose (2003), we propose that a satisfying innovative service experience may have a spillover effect on customer equity for the brand.

Hypothesis 2: Customers' experience of contactless service has a significant positive effect on customer equity.

Following Lee and Park (2019), an increase in delight can add value to customer equity. With increased delight, customers consider the relationship with a hotel to be fair, and the resulting emotional outputs outweigh customer inputs. Therefore, we propose:

Hypothesis 3: Customers' experience of contactless service has a significant positive effect on customer equity via delight.

Customer equity, customer satisfaction, and trust

All commercial entities are driven by the ultimate goal of profitably maintaining their existence. Simultaneously, consumers in the marketplace seek maximum benefit at minimal cost (Sürücü *et al.*, 2019). Delight is emotionally driven, whereas satisfaction is cognitively

driven (Back and Parks, 2003). Consumers expect their preferred or purchased products or services to meet or exceed their requirements, and this creates satisfaction (Pizam *et al.*, 2016). Based on Sürücü *et al.* (2019), we propose that increased customer equity can enhance satisfaction:

Hypothesis 4: Customer equity has a significant positive effect on satisfaction.

Customers' trust in a brand evolves from past experiences and interactions, often portrayed as an individual's experiential process of temporal learning (Garbarino and Johnson, 1999). High customer equity suggests that the brand has specific qualities that make it consistent, competent, honest, and responsible, which leads to higher trust (Delgado - Ballester and Munuera - Alemán, 2005; Sürücü *et al.*, 2019). Therefore, we propose:

Hypothesis 5: Customer equity has a significant positive effect on trust.

Customer equity plays a vital role in services, as the more prestigious and influential the brand, the higher a customer's service satisfaction and trust in the brand (Berry, 2000; Sürücü *et al.*, 2019). Therefore, we propose a mediating effect for satisfaction that strengthens the positive relationship between customer equity and trust. The proposed conceptual model is shown in Figure 2.

Hypothesis 6: Customer equity positively influences trust via satisfaction.

[Insert Figure 2 near here]

Methods

The Chinese mainland was chosen as the main research area for two reasons. First, while this was the first region to suffer from the health risks of the coronavirus pandemic, it has—since May 2020—recovered from these losses, thus it presents the post-pandemic scenario to some extent. Second, during the early stages of the pandemic, major Chinese hotel brands introduced contactless services, which developed rapidly and were widely accepted on the Chinese mainland (Hao *et al.*, 2020).

A Hong Kong-based survey company was hired to conduct the survey online. The company maintains a 5,190,000-member-sample pool on the Chinese mainland with a relatively balanced distribution in age, gender, city-tier, monthly household income, and savings. With combined quota sampling and random sampling, the survey company first selected the sample groups based on the quotas required (balanced age, gender, and income) within each of the quota groups; we, then, proceeded with random sampling. After adjusting the questionnaires based on a 200-respondent pilot test, 4,847 respondents accessed the survey via an invitation email; among them, 1,600 participants completed the survey and received the awarded points. After screening out unengaged respondents—who gave the same answer to more than 90% of the Likert scale items—1,537 questionnaires were deemed eligible for further analysis. The profiles of the respondents are presented in Table 1.

[Insert Table 1 near here]

Respondents were recruited based on the following criteria: 1) Chinese citizens older than 18-year-old; 2) living in 10 selected first-tier cities with a balanced geographical allocation (shown in Table 1); and 3) stayed in a contactless hotel—as recognized by major Chinese online travel agents—for at least one night from January 2020 to January 2021. Six screening questions (S1-S6) were used to filter unwanted respondents, ensure that respondents met target specifications, and eliminate respondent bias. S1 was to keep a general gender balance by recruiting each gender within the range of $50\% \pm 10\%$ (960 respondents). Once a certain gender exceeded the limit, the survey company stopped recruiting respondents of this gender. S2 automatically terminated the survey with a “thank you letter” for respondents who chose the category “under 18 years old.” S3 was associated with a list of 49 first-tier and second tier-cities. Only respondents who chose the 10 pre-defined cities could access the next question. As recommended by the survey company, S4 terminated the survey for respondents employed in

advertising, marketing, market research, media, public relations, or the hotel industry because they were deemed to be more experienced in online surveys, and their answers could be biased. S5: “Have you engaged in any of the following leisure activities from January 2020 to January 2021?” involved a multiple choice of 10 different leisure activities (e.g., visiting a theme park, etc.). Respondents who did not choose “staying at a hotel” were screened out. S6: “Which hotels have you stayed at from January 2020 to January 2021?” mentioned a list of 30 contactless hotel brands, 10 non-contactless hotel brands, and the choice “none of them”; respondents who had stayed at any of the contactless hotels were eligible to access the following questionnaire sections.

The questionnaire included customers’ demographic information and travel experience, their experience of contactless service, as well as, customer equity, delight, satisfaction, and trust in the latest contactless hotel brand that they had visited. All constructs were measured using seven-point Likert scales extracted from the existing literature. Specifically, five items of experience were drawn from Bravo *et al.* (2019); three items of value equity, three items of brand equity, and four items of relationship equity developed by Vogel *et al.* (2008); four items of delight developed by Sweeney *et al.* (2020); three items of satisfaction developed by Homburg *et al.* (2009); and six items of trust developed by Venkatesh *et al.* (2012) were drawn. Traditionally, partial least squares structural equation modeling (PLS-SEM) requires a minimum sample size of 10 (or even 5) times the number of indicators of the most complex latent construct (Hair *et al.*, 2012), and thereby this study required a minimum of 100 (10*10 indicators in the second-order construct customer equity) sample size. However, Goodhue *et al.* (2012) argued that the rule of 10 (or the rule of 5) may cause a statistically significant loss of power. G*power was also adopted to double-check the sample size with F tests in the condition of linear multiple regression for fixed model and R^2 deviation from zero. Giving effect size = 0.1, probability of error = 0.01, power (1- β probability of error) = 0.95, tested and total number of predictors = 4 according to the instruction of Faul *et al.* (2009), as a result, the minimum sample size is 245, with noncentrality parameter = 25.00, critical F = 3.3966, numerator df = 4, denominator df = 250, and actual power = 0.95. Therefore, the sample size applied in this study is considered as adequate for the proposed conceptual model.

Results

Data analysis

Data were analyzed using PLS-SEM using SmartPLS 3 software. PLS-SEM estimates partial model structures by integrating principal component analysis and ordinary least squares regressions (Mateos-Aparicio, 2011). Compared to CB-SEM, PLS-SEM is more advantageous in assessing complex models and in exploring extensions of established theories (Hair *et al.*, 2019). Notably, PLS-SEM is fairly robust only when the skew or kurtosis is small to moderate (up to skew = 1.1 and kurtosis = 1.6). Extremely skewed data (skew = 1.8 and kurtosis = 3.8) may create “a substantial and statistically significant loss of power” (Goodhue *et al.*, 2012, p. 990). In this study, expecting EX5 (kurtosis = 1.095) has a small distribution issue, other indicators are free from distribution concern, and thus meet the need for the normalization of data for PLS-SEM (Jannoo *et al.*, 2014)

Assessing measurement models

The proposed reflective measurement models were estimated for (1) internal consistency reliability, (2) indicator loadings, (3) convergent validity, and (4) discriminant validity.

First, internal consistency reliability was estimated using Cronbach’s alpha (α), Joreskog’s rho (rho_A), and composite reliability (Dijkstra and Henseler, 2015; Jöreskog, 1971). As a rule of thumb, the thresholds of 0.60, 0.70, and 0.90 (less than 0.95) are considered as *acceptable*, *satisfactory*, and *good*, respectively (Hair *et al.*, 2019). As shown in Table 2, all constructs under investigation achieved acceptable to good internal consistency reliability.

[Insert Table 2 near here]

Second, in Table 2, all indicators except for VE1, BT5, and BT6 were loaded higher than 0.7, which means they explained more than 50% of the variance of the indicator (Hair *et al.*, 2019). Considering the acceptable validity and reliability, we decided to keep those indicators in the measurement model (Rasoolimanesh *et al.*, 2017).

Third, the average variance extracted (AVE) was adopted to assess discriminant validity (Table 2). All AVE values are higher than 0.5; more than 50% of the variance of indicators is explained by the construct. The discriminant validity of the measurement model is measured based on the Fornell-Larcker Criterion (1981): the positive square root of the AVE for each latent variable should be higher than the highest correlation with any other latent

variable. There is sufficient discriminant validity throughout, and all constructs are empirically distinct from the other constructs in the proposed model (Table 3). Following the study of Henseler *et al.* (2015), the heterotrait-monotrait (HTMT) ratio of correlations is also applied to strengthen the discriminant validity reporting (Table 3). All HTMT values are lower than 0.90; therefore, discriminant validity has been established among latent constructs.

[Insert Table 3 near here]

Assessing a higher-order model

Customer equity is positioned as a higher-order endogenous construct that comprises value-, brand-, and relationship-equity. A higher-order confirmatory factor analysis was conducted to examine whether customer equity is explained by large variances across its three dimensions. However, using all the first-order common factors' manifest variables directly to measure the higher-order construct involves the repeated computation of indicators to evoke artificially correlated residuals. Therefore, we adopted the two-stage approach proposed by Van Riel *et al.* (2017) to estimate the hierarchical constructs (Table 4).

In the first stage, the higher-order construct is excluded, and only first-order constructs are assessed to obtain latent variable scores. In the second stage, the latent variable scores of the first-order constructs are processed as manifest variables of the higher-order construct. The first-order constructs are reduced to a single-item construct for both statistical (avoiding multicollinearity among indicators) and practical benefits (avoiding double-counting). Notably, relationship equity is the most powerful dimension (0.459) in customer equity. This finding is different from that of Hyun (2009) who found that brand value is the most important determinant (0.8) in the setting of chain restaurant brands, but it is in line with findings of Ou and Verhoef (2017) in the general business world. This indicates that the importance of value-, brand-, and relationship equity depends on the specific service encounter.

[Insert Table 4 near here]

Assessing structural models

A self-report survey may involve the risk of common method bias. Following Podsakoff *et al.* (2003) and Liang *et al.* (2007), common method bias was analyzed using two approaches. First, results from a Harmon one-factor test indicate that the most covariance explained by one

factor is 35.549%. It is lower than the threshold of 50%, representing a low risk of common method bias. Secondly, a common method factor was included to examine the common method bias in PLS-SEM model. Following Liang *et al.* (2007), all indicators were converted into single-indicator constructs. The coefficients between each single-indicator construct and its substantive construct are compared with the variances of each observed construct explained by the method factor (Table 5). Because the squared values of method factor loadings (average 0.002) are 250 times smaller than all squared values of factor loadings (average 0.5), the common method bias is not a serious concern to this study.

Multivariate assumptions of outliers, normality, collinearity, and homoscedasticity were examined prior to the structural model analysis. A cook's distance analysis was conducted in SPSS 26 to identify multivariate influential outliers. As most cases were far lesser than 0.1, no outlier was removed. Multivariate assumptions of normality were examined based on the skewness and kurtosis of the new variables of each latent construct generated from exploratory factor analysis. As all absolute values of skewness and kurtosis are lower than one, there is no serious concern of normality. The variable inflation factors (VIF) for predecessor constructs on dependent variables are evaluated; all VIFs are less than the threshold of multicollinearity defined by O'brien (2007) and considered as acceptable. In addition, scatterplots of regression standardized residual and the dependent variable present consistent patterns, which suggests paths in the model are heteroskedastic.

[Insert Table 5 near here]

The R^2 value of the endogenous constructs represents the in-sample predictive power of the proposed structural model (Shmueli and Koppius, 2011). As a rule of thumb, 25% ($R^2=0.25$) indicates an adequate variance level. From Table 6, customer equity, satisfaction, and trust indicate moderate explanatory power, and delight represents a weaker explanatory power (Hair *et al.*, 2011). The square root of the average squared element of the residual correlation matrix (SRMR) value of 0.056 indicates an acceptable model fit (Hu and Bentler, 1999)—the measurement model adequately explains the covariation in the data (Fan *et al.*, 2016). Additionally, NFI = 0.90 exceeds the threshold for acceptable model fit (Lohmöller, 1989)—the proposed structural model had an acceptable model fit.

[Insert Table 6 near here]

A bootstrapping with 5,000 subsamples is applied to test hypotheses H1–H6 (Chin, 1998), and the results are shown in Figure 3 and Table 7. All hypotheses are supported at a significant level of 0.01. The experience of contactless service positively influences delight (0.634) and customer equity (0.662). Echoes to Balachander and Ghose (2003), a pleasant encounter with an innovative service or technology may generate a spillover effect on customers' emotional and cognitive assessments of the service provider. Notably, supporting Lee and Park (2019), the effect of customers' experience of contactless service on customer equity is significantly strengthened by delight (0.178). According to Pritchard (1969), with increased delight, customers consider their relationship with hotels to be fair, and the emotional output from the hospitality experience outweighs the customer input in this experience, thereby contributing more to value-, brand-, and relationship equity.

Customer equity positively influences satisfaction (0.763) and trust (0.515). According to the equity theory (Adams, 1963), customers strive for maximum benefits at minimum cost (Sürücü *et al.*, 2019), which is supported by these findings, and once customers benefit from the input/output ratio in a service encounter, their expectations are met, resulting in long-standing brand-customer relationships (Berry, 2000; Delgado - Ballester and Munuera - Alemán, 2005). Moreover, the positive relationship between customer equity and trust is significantly strengthened via the mediating effect of satisfaction (0.329).

[Insert Table 7 near here]

[Insert Figure 3 near here]

Importance-performance map analysis (IPMA)

The IPMA is performed following the technique proposed by Ringle and Sarstedt (2016) to evaluate the significance of critical variables and constructs. IPMA extends the results of PLS-SEM by bringing the performance of each construct into practical PLS-SEM exploration by comparing the total effects of latent constructs that indicate their importance in influencing the target construct with the average scores of latent constructs that represent their performance (Fornell *et al.*, 1996). Performance values are computed based on the mean values of the rescaled indicators, whereas importance values are computed according to the total effect of direct or indirect relationships between the predicting construct and the target construct (Hair *et al.*, 2017). To interpret and compare different performance levels, latent variable scores are

rescaled on a range between 0 (representing the lowest performance) and 100 (representing the highest performance).

The importance-performance map is shown in Table 8 with customer equity, satisfaction, and trust as target constructs, respectively. Considering customer equity as the target construct, the performance of experience (73.355) is slightly higher than delight (71.198), and with a total effect of 0.828, the importance of experience is particularly high. A one-unit increase in experience from 73.355 to 74.355 will increase the performance of customer equity by 0.828 points. Considering satisfaction as the target construct, experience has slightly higher performance (76.152) than other constructs, whereas customer equity (0.836) has higher importance than experience (0.692) and delight (0.205). In a similar vein, when setting trust as the target construct, whereas experience (76.152) has the highest performance, customer equity (0.743) has higher importance than experience (0.614), satisfaction (0.233), and delight (0.183).

[Insert Table 8 near here]

Adjusted importance-performance maps are shown in Figures 4, 5, and 6. Each map is divided into four areas with two lines representing mean values of importance (vertical) and performance (horizontal). According to Ringle and Sarstedt (2016) and Martilla and James (1977), (1) constructs in the higher left quadrant (e.g. satisfaction for trust) with low importance and high performance are indicative of constructs that are not important, but well-executed, and are associated with the risk of possible overkill, leading to less effectiveness in managerial actions; (2) constructs in the higher right quadrant (e.g. experience for customer equity, satisfaction, and trust) with high importance and high performance are important and have been well-executed; (3) constructs in the lower left quadrant (e.g. delight for customer equity, satisfaction, and trust) with low importance and low performance are not important constructs, and thus no action is needed; (4) and constructs in the lower right quadrant (e.g. customer equity for satisfaction and trust) with high importance and low performance are important, but have not been executed well, and thus should be highly prioritized. Thereby, practical strategies can help prioritize certain constructs based on the IPMA. The details are illustrated in the practical implications section.

[Insert Figure 4,5,6 near here]

Conclusions

Contactless technologies have been around for years, but they have become especially important during the COVID-19 pandemic. This study examined the potential ROI of contactless service from the customer equity perspective. Drawing on the equity theory, this study proposed a theoretical framework to provide a more in-depth understanding of customer equity in the context of contactless hospitality services. Applying a second-order PLS model, it explores the direct and indirect effect of experience and delight on customer equity, together with the direct and indirect influence of customer equity on satisfaction and trust.

The findings reveal that customers' experience of contactless service can effectively enhance delight and customer equity; increased customer equity results in a higher degree of satisfaction and trust. We show a spillover effect from an innovative service or technology experience to the emotional and cognitive assessment of the service provider. Insights from this study contribute to hospitality research and to companies searching for novel approaches to respond to customers' pandemic-related concerns.

Theoretical implications

This study offers three major theoretical contributions to the literature. Our results support the reasoning of Hao *et al.* (2020), Gursoy *et al.* (2020), Chiang and Trimi (2020), Kim *et al.* (2021), Rahimzhan and Irani (2020), Zeng *et al.* (2020), and Jiang and Wen (2020) that the implementation and management of contactless service will create more secure and delightful experiences for customers.

First, the systematic study of contactless service—and hypothetically testing the causal relationship between the experience of contactless service, delight, and customer equity in general and against the current COVID-19 challenges, in particular—is paramount in advancing the literature that explores technology and experiences in hospitality, especially among hotels. The experience of contactless service generates greater emotional and cognitive benefits for customers.

Second, by considering customer equity as a three-dimensional higher-order construct that embraces value-, brand-, and relationship equity, our findings contribute to the literature on customer equity in hospitality. This finding advances the conceptual model of Pizam *et al.* (2016). Significantly, our results contradict the concern that as an emergency measure to cope with the pandemic, contactless services would not only waste corporate resources but also reduce experience due to a lack of personalized care once the pandemic subsides, thereby addressing the recent calls for research on this topic to clarify these mixed results.

Third, by developing a customer equity model of its drivers and consequences that is verified empirically in a hotel setting, our findings offer strong support for our theorizing of the direct and indirect causal relationship between the experience of contactless service, delight, customer equity, satisfaction, and trust. This study promotes a superior experience with an innovative service design that enhances the emotional attachment and cognitive evaluation of the brand. Rooted in equity theory, which indicates that consumers in the marketplace seek to attain maximum benefits with minimal cost (Pritchard, 1969), this study represents the unifying theoretical underpinning for customer equity and innovative service design. When customers' outcomes outweigh their input, they experience higher levels of perceived value, brand assets, and customer-brand relationships, which fosters enhanced emotional and cognitive attachment to the service brand.

Fourth, this study develops knowledge of innovative service design in the field of hospitality. Service innovativeness is a crucial driver of customer co-creation, satisfaction, advocacy, and loyalty (Hollebeek and Rather, 2019). We propose contactless service as an innovative service design protocol. The essence of the hospitality industry is to improve social well-being by providing novel services in creating pleasurable experiences. With increasing multidimensionality, researchers and practitioners are facing enormous complexity in satisfying customer needs and managing workplace challenges. The coronavirus pandemic has further prompted the need for enhanced application of service design, which is a valid methodological approach for value co-creation in hospitality, by integrating the employment of actors, resources, and technologies to engender the envisioned value (Font *et al.*, 2021). Service design thinking enables hospitality firms to identify the critical *touchpoints* across different phases of experiences (Webb, 2016).

Practical implications

In addition to the theoretical relevance, this research has practical implications relevant to hospitality firms and provides new insight into how innovative service design can enhance customers' emotional attachment and cognitive evaluation of hospitality brands. First, the implementation of contactless service will enhance customer equity and experience not only currently, but also in the aftermath of the coronavirus pandemic. This is especially important to help the hospitality industry recover as travel regains momentum. Affected by the health risks associated with the pandemic, clients demand more secure—albeit engaging and memorable—experiences. Contactless service has emerged as an innovative service design to

safeguard customers and staff while establishing stronger interactive and engaging service experiences.

Second, IPMA results provide critical insights into the role of predecessor constructs and their application for effective managerial actions and marketing programs (Martilla and James, 1977; Ringle and Sarstedt, 2016). When hospitality managers aim to improve satisfaction and trust in the context of contactless hospitality service, they should focus on adding value to customer equity, an important predecessor construct with the potential to be executed more effectively. Based on our research results, to add value to customer equity, management must prioritize optimizing experience.

Third, human-centric is at the core of the design for contactless service to provide customers with more memorable experiences and greater customer equity. Innovative service design, such as contactless service, requires a comprehensive and empathic understanding of customers (Stickdorn *et al.*, 2018), which can foster the visualization and formulation of choreographed solutions to challenges that may not yet exist. The service design of contactless service is more than replacing human labor with technology. Hospitality practitioners should systematize and visualize the customer journey service interfaces along the time axis, based on which design opportunities for valuable contactless customer service propositions can be created. People from different backgrounds and expertise can collaborate in identifying major issues and expectations through distinct service encounters to provide design solutions that utilize available technology and resources.

Fourth, not all hospitality firms are expected to invest in a whole package of contactless services; instead, they may choose certain technologies depending on their viability, feasibility, and desirability based on a holistic account of the servicescape (Line and Hanks, 2020). For instance, Hilton has widely implemented digital key and digital floor plans across its 11 brands in the US; Bed XYZ created smart contactless rooms where customers can use a smartphone to adjust humidity and light, block out background noise, and alter mattress firmness; Robot Alliance utilizes a service robot to alleviate the concern of human contact in serving food and beverages; and Hotel River developed an autonomous adventure vehicle to provide mobile accommodation and remove human contact (Healy, 2021). Hospitality firms can also consider contactless modules, such as thermal temperature measurement; self-service check-in kiosks; touch-free handles, interfaces, and room entrances; gesture or voice-controlled elevators with improved air filtration; handrail ultra-violet sterilizers; visual physical-distancing/sanitization cues; cleaning and service robots; new movement flows; and staggered and scheduled usage of gyms, conference rooms, and spas. (McKinsey and Company, 2020).

Limitations and future research

This study has several limitations that indicate directions for future research. (1) Our research was limited to customers from the Chinese mainland. As the pandemic dissipates, future studies should focus on other regions by engaging a more robust global sample; it would also be meaningful to test the proposed model across different cultural groups and customer segments. (2) Our findings are derived from interviews and large-scale surveys, whereas future studies can adopt a hybrid approach to ascertain a more in-depth understanding of the experience of contactless service and customer equity, including value-adding methods that integrate various *analytic devices* to broaden the scope and unleash interpretive imagination (Hao and Xiao, 2021); or employing longitudinal studies that explore how the veracity of the proposed model changes during different phases and easing of the pandemic. (3) Although beyond the scope of the current research, it is also advisable to conduct a multi-group analysis among different customer segments according to their demographic features and technological readiness that includes customers' innovativeness, optimism, discomfort, and insecurity utilizing technology (Parasuraman and Colby, 2015). This includes the effort and performance expectations, social influence, and perceived value of contactless service (Venkatesh *et al.*, 2012). (4) Future research can conduct an in-depth exploration of customers' acceptance and willingness to pay for major contactless hospitality modules.

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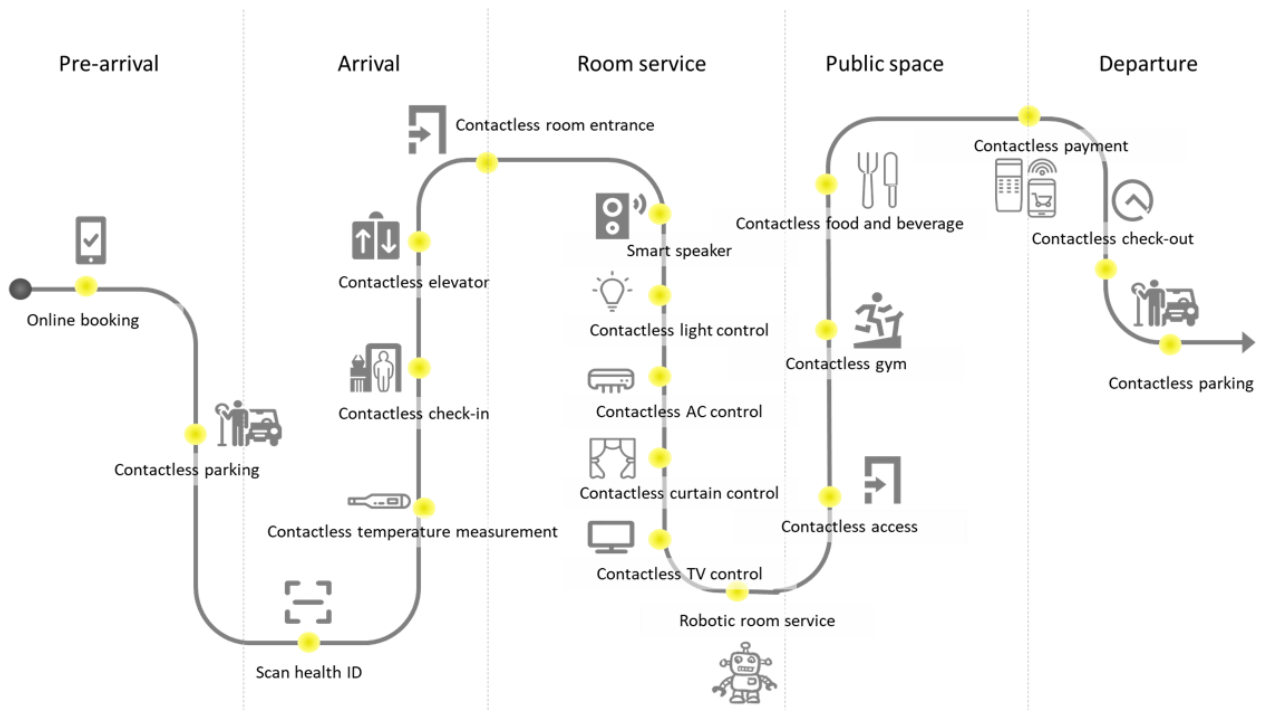


Figure 1. Contactless service in hotels

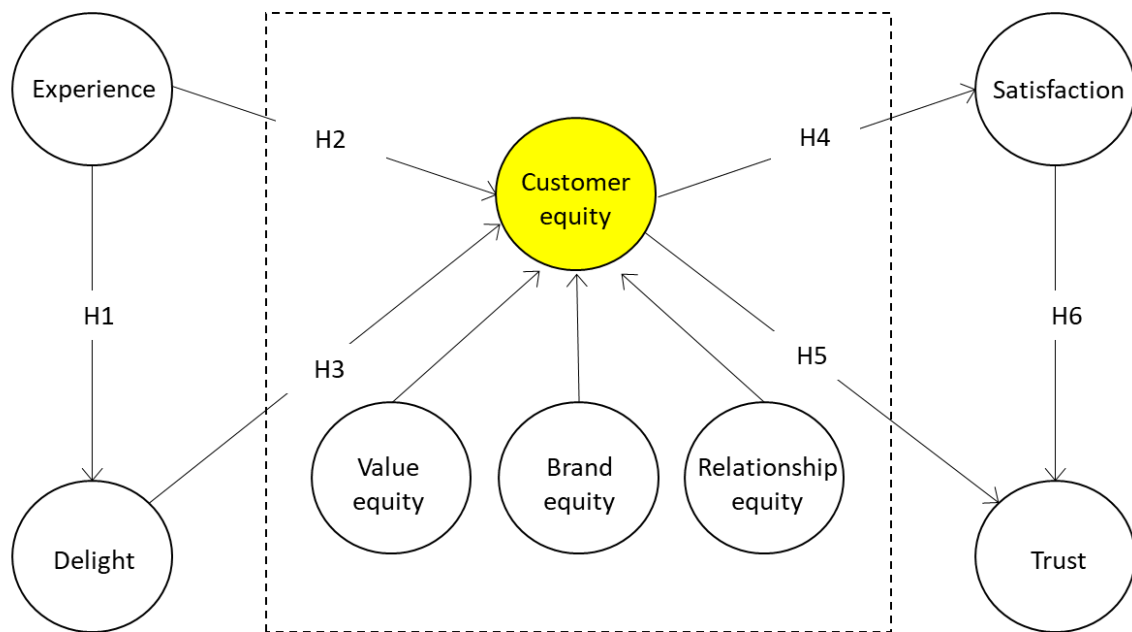


Figure 2. The proposed model of customer equity in the context of contactless hospitality service

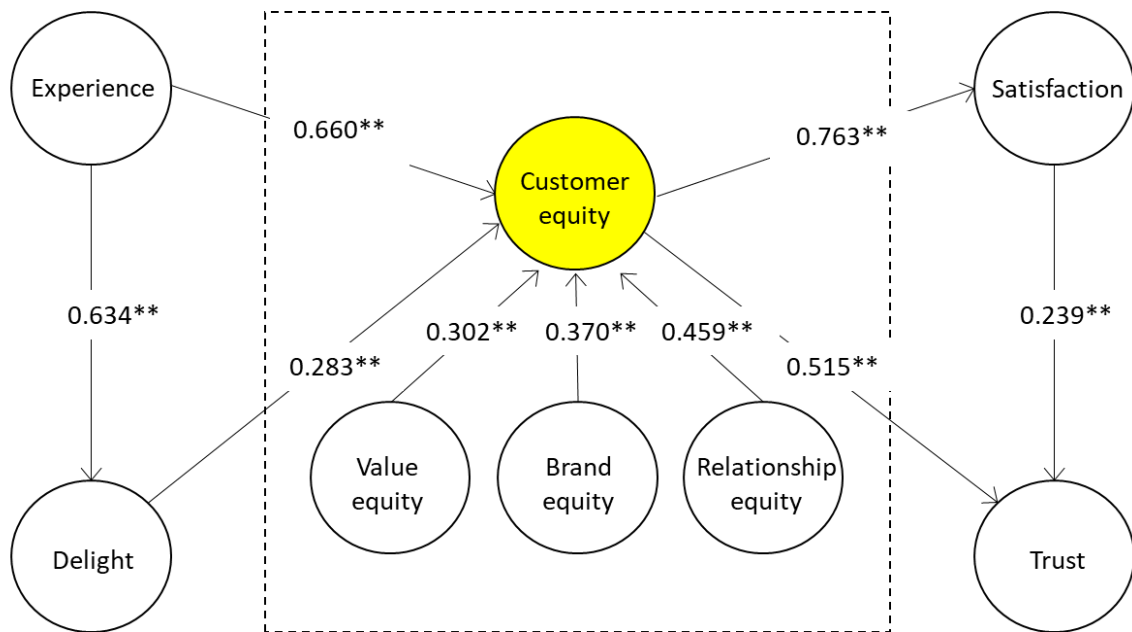


Figure 3. The structural model of customer equity in the context of contactless hospitality service

Note: All paths are significant at 0.01 level.

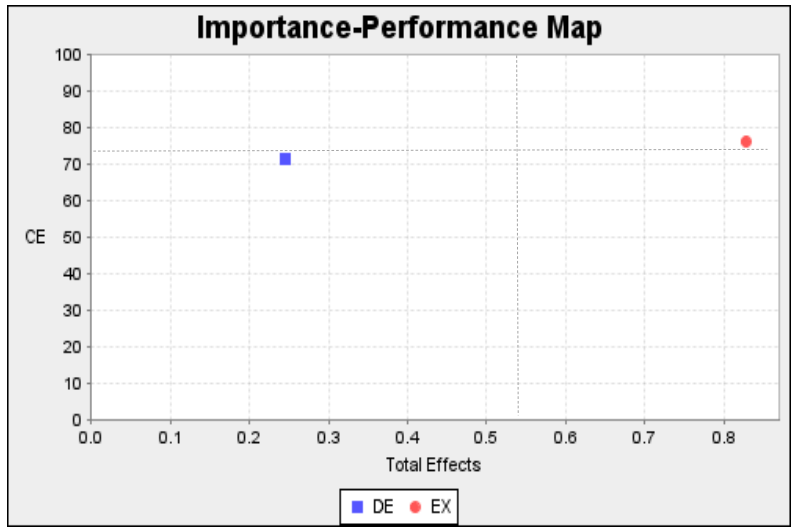


Figure 4. Adjusted importance performance map with *customer equity* as target construct

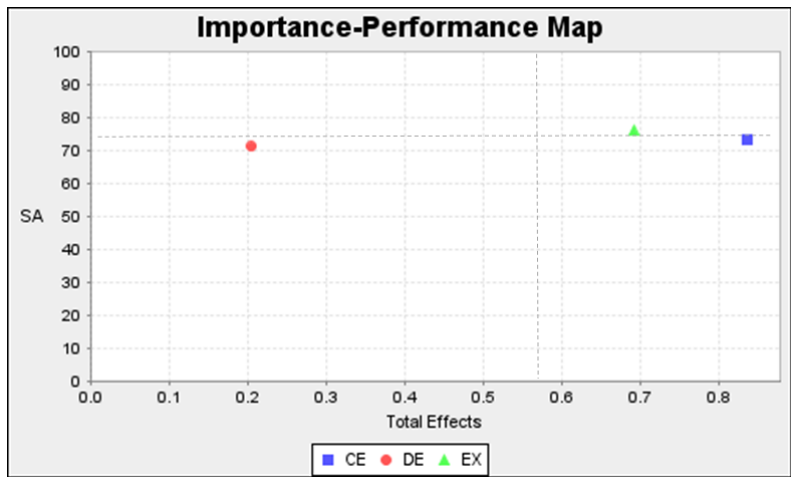


Figure 5. Adjusted importance performance map with *satisfaction* as target construct

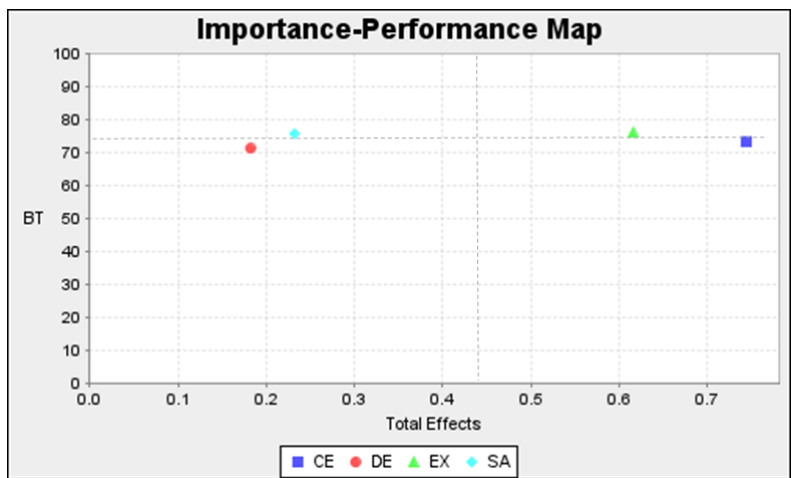


Figure 6. Adjusted importance performance map with *brand trust* as target construct

Table 1. Profile of respondents

Items	Category	<i>f</i>	%	Items	Category	<i>f</i>	%
Gender	Male	870	56.6	Age	18–25	196	12.8
	Female	667	43.4		26–35	603	39.2
Occupation	Civic servant	214	13.9		36–45	384	25
	Teacher	39	2.5		46–55	122	7.9
	Business managers	796	51.8		56–65	225	14.6
	Workers	46	3		66 and above	7	0.5
	Farmer	3	0.2	City	Beijing	301	19.6
	Self-employed	118	7.7		Shanghai	284	18.5
Freelancers	89	5.8	Guangzhou		243	15.8	
Full-time student	25	1.6	Shenzhen		82	5.3	
Retired	96	6.2	Chengdu		147	9.6	
Other	111	7.2	Hangzhou		111	7.2	
Frequency	1–3 nights	257	16.7		Wuhan	82	5.3
	4–10 nights	823	53.5		Xi'an	94	6.1
	11 nights and above	457	29.7	Tianjin	79	5.1	
Price (RMB)	0–300	99	6.4	Qingdao	114	7.4	
	301–600	683	44.4	Education	Junior high and below	15	1
	601–900	532	34.6		High school	70	4.6
	901–1,200	191	12.4		Collage	240	15.6
	1,201 and above	32	2.1		Undergraduate	1114	72.5
Travel companion	No travel companion	456	29.7		Postgraduate	98	6.4
	Friends and/or relatives	289	18.8	Income (RMB)	0–3,000	2	0.1
	Partner without child(ren)	483	31.4		3,001–6,000	25	1.6
	Partner and child(ren)	303	19.7		6,001–10,000	122	7.9
	Child(ren)	6	0.4		10,001–20,000	740	48.1
			20,001–30,000		485	31.6	
			30,001 and above	163	10.6		

Table 2. Assessment results of the reflective measurement model.

Indicators	M	SD	SK	KU	VIF	L
EX ($\alpha = 0.767$; $\rho_A = 0.769$, CR= 0.843; AVE= 0.517), adopted from Bravo et al. (2019)						
EX1. The contactless service suits my needs.	5.62	0.991	-0.568	0.544	1.411	0.726
EX2. The contactless service is reliable.	5.64	1.003	-0.547	0.180	1.393	0.708
EX3. Hotels with contactless service are superior to other hotels.	5.49	0.995	-0.470	0.301	1.425	0.731
EX4. The contactless service is a good service.	5.59	0.976	-0.513	0.386	1.392	0.707
EX5. The contactless service is a quality service.	5.51	1.015	-0.699	1.095	1.457	0.743
DE ($\alpha = 0.718$; $\rho_A = 0.722$, CR= 0.824; AVE= 0.539), adopted from Sweeney, Payne, Frow, and Liu (2020)						
DE1. This hotel offers me things I never expected.	5.44	1.048	-0.573	0.638	1.318	0.757
DE2. What this hotel does, often exceeds my wildest expectations.	4.98	1.266	-0.588	0.289	1.414	0.720
DE3. This hotel frequently performs beyond my expectations.	5.35	1.037	-0.563	0.577	1.298	0.733
DE4. I am often surprised by the things this hotel can do.	5.19	1.134	-0.580	0.336	1.413	0.727
VE ($\alpha = 0.609$; $\rho_A = 0.615$, CR= 0.768; AVE= 0.526), adopted from Zeithaml, Lemon, & Rust (2001)						
VE1. I stay with this hotel because both (this hotel and I) can earn a profit from it.	5.11	1.265	-0.778	0.778	1.166	0.637
VE2. I want to keep working with this hotel because it is difficult to find other hotels like it.	5.25	1.117	-0.547	0.509	1.233	0.755
VE3. I am happy with the service received from this hotel.	5.58	1.007	-0.573	0.466	1.124	0.776
BE ($\alpha = 0.692$; $\rho_A = 0.692$, CR= 0.830; AVE= 0.619), adopted from Zeithaml, Lemon, & Rust (2001)						
BE1. I pay a lot of attention to everything about this hotel.	5.41	1.077	-0.481	0.053	1.362	0.787
BE2. Everything related to this hotel grabs my interest.	5.39	1.057	-0.434	-0.063	1.381	0.796
BE3. I identify myself with the values that this hotel represents for me.	5.37	1.093	-0.504	0.295	1.308	0.777
RE ($\alpha = 0.731$; $\rho_A = 0.731$, CR= 0.832; AVE= 0.553), adopted from Zeithaml, Lemon, & Rust (2001)						
RE1. I have trust in this hotel for hiring a financial service.	5.59	0.978	-0.565	0.510	1.334	0.735
RE2. I feel this hotel is close to me.	5.45	1.035	-0.474	0.084	1.410	0.761
RE3. I think this hotel makes several investments to improve our relationship.	5.46	1.077	-0.652	0.752	1.363	0.729
RE4. I perceive that this hotel makes an effort to improve our relationship.	5.52	1.004	-0.448	0.082	1.391	0.748
SA ($\alpha = 0.690$; $\rho_A = 0.690$, CR= 0.829; AVE= 0.617), adopted from Homburg, Wieseke, and Hoyer (2009)						
SA1. All in all, I am very satisfied with this hotel.	5.58	0.971	-0.594	0.507	1.332	0.776
SA2. This hotel compares to my vision of an ideal hotel.	5.56	0.992	-0.529	0.440	1.366	0.794
SA3. The performance of this hotel always fulfills my expectations.	5.51	0.991	-0.513	0.282	1.328	0.787
BT ($\alpha = 0.777$; $\rho_A = 0.778$, CR=0.848; AVE= 0.528), adopted from Alalwan, et.al., (2018)						
BT1. I believe that contactless service is trustworthy.	5.55	1.027	-0.596	0.534	1.532	0.749
BT2. I trust in contactless service.	5.49	1.053	-0.579	0.318	1.507	0.745
BT3. I do not doubt the honesty of contactless service.	5.26	1.129	-0.636	0.560	1.488	0.728
BT4. I feel assured that legal and technological structures adequately protect me from problems with contactless service.	5.36	1.119	-0.628	0.503	1.398	0.700
BT5. Even if not monitored I trust contactless service to do the job right.	5.34	1.100	-0.726	0.810	1.423	0.712
BT6. Contactless service has the ability to fulfil its task (eliminated)	5.56	1.001	-0.566	0.590	1.352	0.674

Note: Note. M = Mean, SD = Standard deviation, SK = Skewness, KU = Kurtosis, L = Loading, α = Cronbach's alpha, ρ_A = Joreskog's rho, CR= composite reliability, AVE average variance extracted.

Table 3. Discriminant validity

	<i>a</i>	rhoA	CR	AVE	EX		DE		CE		SA		BT
					F	HM	F	HM	F	HM	F	HM	F
EX	0.767	0.769	0.843	0.517	0.719								
DE	0.718	0.722	0.824	0.539	0.634	0.735	0.734						
CE	0.858	0.862	0.887	0.541	0.640	0.828	0.701	0.789	0.664				
SA	0.690	0.690	0.829	0.617	0.673	0.862	0.588	0.718	0.604	0.887	0.786		
BT	0.798	0.799	0.856	0.498	0.688	0.876	0.538	0.704	0.697	0.739	0.632	0.849	0.726

Note: F = Fornell-Larcker Criterion, HM = Heterotrait-monotrait Ratio of Correlations. Boldface values show the square roots of AVE.

Table 4. Higher-order confirmatory factor analysis of CE

First-order construct	Indicator	First-order		Higher-order	
		Loading	<i>t</i>	Loading	<i>t</i>
VE1	VE	0.637	25.095	0.302	42.123
VE2		0.755	45.254		
VE3		0.776	63.768		
BE1	BE	0.787	65.088	0.370	55.015
BE2		0.796	70.863		
BE3		0.777	67.731		
RE1	RE	0.735	50.234	0.459	61.601
RE2		0.761	58.617		
RE3		0.729	48.872		
RE4		0.748	53.238		

Table 5. Common method bias analysis

Construct	Indicator	R1	R1 ²	R2	R2 ²
BT	BT1	0.728***	0.530	0.033	0.001
	BT2	0.726***	0.527	0	0.000
	BT3	0.729***	0.531	-0.032	0.001
	BT4	0.698***	0.487	-0.054**	0.003
	BT5	0.7***	0.490	-0.017	0.000
	BT6	0.649***	0.421	0.073***	0.005
CE	BE1	0.697***	0.487	-0.021	0.000
	BE2	0.684***	0.468	0.015	0.000
	BE3	0.702***	0.493	-0.029	0.001
	RE1	0.654***	0.428	0.034	0.001
	RE2	0.711***	0.506	-0.055**	0.003
	RE3	0.66***	0.436	0.047*	0.002
	RE4	0.68***	0.462	0.048*	0.002
	VE1	0.538***	0.289	-0.098***	0.010
	VE2	0.652***	0.425	-0.057**	0.003
VE3	0.65***	0.423	0.094***	0.009	
DE	DE1	0.713***	0.508	0.068***	0.005
	DE2	0.767***	0.588	-0.084***	0.007
	DE3	0.703***	0.493	0.049**	0.002
	DE4	0.759***	0.576	-0.026	0.001
EX	EX1	0.717***	0.514	0.018	0.000
	EX2	0.692***	0.479	0.064**	0.004
	EX3	0.728***	0.530	-0.025	0.001
	EX4	0.714***	0.510	-0.014	0.000
	EX5	0.745***	0.555	-0.041*	0.002
SA	SA1	0.782***	0.612	-0.004	0.000
	SA2	0.797***	0.635	-0.005	0.000
	SA3	0.777***	0.604	0.009	0.000
Average			0.500		0.002

Note: R1 = Substantive Factor Loading, R2 = Method Factor Loading, * $P \leq 0.05$, ** $P \leq 0.01$, *** $P \leq 0.001$

Table 6. Model fit

Construct	<i>a</i>	rho_A	CR	AVE	R²
EX	0.767	0.769	0.843	0.517	
DE	0.718	0.722	0.824	0.539	0.402
CE	0.858	0.862	0.887	0.441	0.752
SA	0.69	0.69	0.829	0.617	0.583
BT	0.798	0.799	0.856	0.498	0.509

Note: SRMR=0.056, d_ULS=1.293, d_G=0.335, Chi-Square=2677.462, NFI=0.90, rms Theta=0.088

Table 7. Hypotheses test

Hypotheses	Mean	SD	<i>t</i>	<i>p</i>	2.50%	97.50%	Result
H1: EX-> CD	0.634	0.021	30.363	0.000	0.592	0.675	Supported
H2: EX-> CE	0.662	0.019	34.263	0.000	0.627	0.698	Supported
H3: EX-> CD-> CE	0.178	0.015	11.655	0.000	0.148	0.207	Supported
H4: CE-> SA	0.763	0.014	54.735	0.000	0.735	0.789	Supported
H5: CE-> BT	0.515	0.037	13.973	0.000	0.439	0.585	Supported
H6: CE-> SA-> BT	0.182	0.027	6.648	0.000	0.13	0.233	Supported

Table 8. The importance-performance analysis

Predecessor constructs	Direct effect	Indirect effect	Importance	Performance
CE as target construct				
DE	0.245		0.245	71.198
EX	0.652	0.176	0.828	73.355
Mean value			0.537	72.277
SA as target construct				
DE		0.205	0.205	71.198
CE	0.836		0.836	73.355
EX		0.692	0.692	76.152
Mean value			0.578	73.568
BT as target construct				
DE		0.183	0.183	71.197
CE	0.548	0.194	0.743	73.335
EX		0.614	0.614	76.152
SA	0.233		0.233	75.813
Mean value			0.443	74.124

Notes: All effects present unstandardized effects. Bootstrapping with 5,000 subsamples are employed and all total effects of importance are significant at 95% confidence intervals.