# Are You Ready for a Contactless Future? A Multi-Group Analysis of Experience, Delight, Customer Equity, and Trust Based on the Technology Readiness Index 2.0

Fei Hao[a*], Kaye Chon[b]

a Fei Hao, Ph.D. Postdoctoral Fellow, School of Hotel and Tourism Management, The Hong Kong Polytechnic University, 17 Science Museum Road, TST East, Kowloon, Hong Kong. Visiting scholar of Conrad N. Hilton College of Hotel and Restaurant Management University of Houston. 4450 University Dr. Fei Hao is the corresponding author and she can be reached by Email: ffaye.hao@polyu.edu.hk.

b Kaye Chon, Ph.D. Dean and Chair Professor, Walter & Wendy Kwok Family Foundation Professor in International Hospitality Management, School of Hotel and Tourism Management, The Hong Kong Polytechnic University, 17 Science Museum Road, TST East, Kowloon, Hong Kong. He can be reached by Tel: +852-3400 2211and Email: kaye.chon@polyu.edu.hk.

* Corresponding author

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**Abstract:** Contactless hospitality services are technology-enabled innovative services combating the challenges of the COVID-19 pandemic. Surveying 1,537 hotel guests, this study explores the relationships between customer experience, customer delight, customer equity, and brand trust in contactless hospitality services. A theoretical model is proposed to investigate the antecedents and consequences of customer equity. The moderating effect of health concerns lies on the path from customer equity to trust. A multi-group analysis was conducted to examine the invariance among proposed paths between two customer groups. The effects of delight on equity and equity on trust are stronger for the low technology readiness group.

**Keywords**: Contactless service, technology readiness index 2.0, customer experience, customer equity, customer experience, customer delight, brand trust, service design, COVID-19, PLS-MGA

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## Introduction

The COVID-19 pandemic has wrought fundamental changes to customer experience design in the hospitality industry. One of these changes is the extensive implementation of contactless amenities and services (Bonfanti et al., 2021; Moon et al., 2021). With a combined package of self-service, robotic services, and IoT-based technology, the high-technology-enabled contactless service entails a touchless and disinfected service procedure throughout the customer journey (Hao et al., 2020). Hospitality firms around the world have widely adopted contactless services to safeguard customers and employees, including voice control (e.g., smart speaker TVs, AC, lighting, curtains), motion sensing (e.g., automatic doors, touchless elevators), mobile control (e.g., mobile check-in and check-out, keyless entrance, digital payments, and digital menus), robotic services (e.g., room service, concierge), facial recognition (e.g., check-in, keyless entrance, payment), to name a few (Hao, 2021). World-leading hotel chains, such as Marriott, Hyatt, and Hilton, have rolled out contactless check-in and keyless access (Sayej, 2021). Especially in China, leading hotel brands, such as JinJiang International Holdings, BTG Homeinn hotel group, Huazhu Hotels Group, Wanda Hotels & Resorts, Dossen International Group, have invested heavily in contactless amenities and services (All-China Federation of Industry and Commerce, 2020).

Contactless hospitality services can provide customers with a more secure and comfortable experience and thus enhance their evaluation of hedonic value and service quality (Li et al., 2021). It is also effective in creating a better sense-, feel-, think-, act-, and relate-experience, thus improving customer satisfaction and information sharing (Chen et al., 2021). Traditionally, however, the hospitality industry is based on the warmth of "human contact," and some misgivings have thus been raised about the efficacy of the contactless service (Skift, 2020). Among them, a key concern is the uncertain return on investment (ROI) of such an undoubtedly expensive endeavor (Hotel News Now, 2020). Therefore, Hao and Chon (2021) called for empirical studies on the ROI of contactless hospitality services to shed light on effective management and marketing programs. In response to this call, this study explores the ROI of contactless hospitality from the perspective of customer equity.

Customer equity is an important aspect of a firm's assessment of the ROI. Building upon equity theory, Adams (1963) proposed the concept of customer equity in the 1960s. Villanueva and Hanssens (2007, p. 8) conceptualized customer equity as "the sum of the discounted stream of cash flows generated from a company's pool of customers." Similarly, Zeithaml et al. (2001, p. 4) defined customer equity as "the discounted lifetime values of all of its customers." In the domain of service marketing and customer relationship management, customer equity serves as a pillar for the development of effective marketing strategies and maintaining sustainable profitability (Vogel et al., 2008). Customer equity management strives to optimize the formula for the cost of customer acquisition and the benefits of customer retention by increasing lifetime value for the customer (Rust et al., 2004). It represents the transformation from product orientation to customer orientation, from one-time transactions to long-term relationships, and from attracting to retaining customers (Zeithaml et al., 2001). Hospitality firms around the world are facing economic uncertainty in the wake of the COVID-19 pandemic, and thus customer equity can be an effective tool to measure the long-term ROI and to augment the allocation of the marketing budget of contactless-related investment (Villanueva and Hanssens, 2007).

Customer experience (Lee & Park, 2019; Nuseir, 2020; Wong, 2013) and customer delight (Lee & Park, 2019) are found to be influential determinants of customer equity. Contactless service is not a new invention, and many contactless technologies (e.g., self-service, robotic services, and Internet of Things) came into being far before the pandemic (Kim & Han, 2020). However, against the current challenge of the pandemic, these technologies are reorganized as centering around the contactless feature throughout the customer journey. Yet, there is a limited understanding of customers' embodied experience and delight related to the newly emerged contactless hospitality service (Hao & Chon, 2021), and the combined effect of customer experience and customer delight on customer equity is unknown. Moreover, the hospitality industry is a central hub that facilitates human mobility and interaction, and thus, the health risk of human-to-human virus transmission raised a critical issue regarding customers' trust in it. Evidence has been found that customer equity plays an active role in improving trust (Cho & Jang, 2017; Delgado-Ballester & Munuera-Alemán, 2005; Sürücü et al., 2019). Thus far, there is scant research on the nomological network of customer equity in the context of contactless hospitality services or technology-enabled service innovation in general; hence, this study attempts to fill the gap by exploring customer experience and customer delight as antecedents, and brand trust as a consequence of customer equity.

Technology readiness indicates customers' "propensity to embrace and use new technologies for accomplishing goals" (Parasuraman, 2000, p. 308). It is defined as a state of mind ensuing from a gestalt of mental enablers and inhibitors that predict people's predisposition to accept and use new technologies. Customers' technology readiness is one of the determinants influencing customers' perception and acceptance of state-of-the-art technologies (Lin et al., 2007), and has been adopted as an effective tool for customer segmentation (Victorino et al., 2009). Contactless service involves a series of technology-enabled solutions and comes with new experiences and new challenges (Hao, 2021). With the proliferation of contactless implementations in the hospitality industry, customers with varying levels of technology readiness may have a different perception of contactless service and react to it differently. Therefore, the hospitality industry should integrate customers' technology readiness into the service design and marketing programs. However, to the best of our knowledge, no research has yet explored the effect of technology readiness as a personal attribute on customer acceptance of contactless services.

To fill in these research gaps, this study explores the antecedents and consequences of customer equity in the context of contactless hospitality service based on the survey of 1,537 hotel guests. The multigroup analysis of partial least squares structural equation modeling (PLS-GMA) is employed to examine the invariance between customers with different levels of technology readiness through different hypothetical paths. Considering the prevailing health challenges caused by the COVID-19 pandemic, this study also investigates the moderating effect of health concerns on the path from customer equity to trust. Our findings could contribute to the knowledge of contactless service as an innovative service design, advance equity theory (Adams, 1963), shed light on consumer behavior studies, and extend the application of Technology Readiness Index 2.0 (TRI 2.0). Additionally, this study also has implications for hospitality and tourism marketing and management.

## Literature review and hypotheses development

### *Technology readiness index (TRI)*

The TRI was developed and validated by Parasuraman (2000). It is a 32-item scale that comprises optimism, innovativeness, discomfort, and insecurity, evaluating customers' readiness to embrace cutting-edge technologies. Specifically, *optimism* refers to a positive perception of technology with the belief that technology affords people more control, flexibility, and efficiency;

*innovativeness* indicates the tendency to open up toward new technology and to become a technology pioneer and opinion leader; *discomfort* is caused by insufficient control over technology and the sense of being overpowered by it; *insecurity* relates to skepticism over the usefulness and competency of technology, and concern regarding its potential destructive consequences. The original index was later updated and streamlined into a 16-item TRI 2.0 scale by Parasuraman and Colby (2015).

Customers' readiness for technology in daily life has a spillover effect on their perception of specific technology-enabled innovative services design; therefore, technology readiness was integrated into a technology acceptance model (Lin et al., 2007). Technology readiness is an effective tool for segmenting customers (Victorino et al., 2009) and predicting customer satisfaction with new technology solutions (Wang et al., 2017). Customers with higher readiness tend to perceive new technology as more useful and easy to use, and can therefore summon higher usage intention (Lin et al., 2007). Conversely, customers that experience more insecurity and discomfort regarding technology often exaggerate the perceived risk and refute its perceived benefits, which proves detrimental to technology usage intention.

Contactless services bring self-service, robotic services, and IoT-based technology together, and they entail a touchless and disinfected service procedure throughout the customer's journey (Hao et al., 2020). There is a growing tendency for hospitality and tourism firms to adopt contactless technology, which requires customers to engage more with the technology-based service ecosystem (Li et al., 2021). However, the mechanism of how technology readiness works on customer equity remains largely unexplained. Following Lee and Park's (2019) advice, we investigate the role of the moderating factors of customer segmentation in shaping the relationship among experience, delight, and equity. This study examines the invariance between customer groups with high and low TRI among hypothetical paths.

*Customer equity (CE)*

Recent studies have emphasized the need to refine and assess customer equity in hospitality and tourism settings (Wu & Li, 2011). Meticulous CE management not only improves customer experience, satisfaction, and loyalty (Kim et al., 2020b; Lee & Park, 2019) but also contributes to a comprehensive, sustainable, and profitable business model (Altinay & Taheri, 2019). Therefore, hospitality firms strive to maximize customer equity through various marketing investments and

customer relationship management schemes (Wu & Li, 2011). For instance, in a hotel service encounter, Sürücü et al. (2019) perceived customer equity as a combined effect of brand awareness, physical quality, staff behavior, and brand image. In the dining industry, value, brand, and relationship management are considered vital determinants of customer equity (Hyun, 2009). In the gambling business, good service encounters, staff service, service convenience, and hedonic service enhance customer equity, which in turn improves satisfaction and loyalty (Wong, 2013). In the convention industry, Severt and Palakurthi (2008) discovered that value equity is the strongest determinant of customer equity. This study investigates the customer equity of contactless services in hotels.

Service marketing literature identifies value, brand, and relationship equity as core sub-drivers of customer equity (Rust et al., 2004). In line with Severt and Palakurthi (2008), Hyun (2009), as well as Ho and Chung (2020), this study perceives customer equity as a customer-oriented appraisal of the brand, its value, and relationships. *Brand equity* refers to a customer's assessment of a service brand's name, sign, symbol, or design—essentially, features that increase the firm's and customer's valuation of the service, compared to its competitors (Aaker, 1991). Brand equity is often employed to develop market differentiation and competitive strategies (Boo et al., 2009). *Value equity* refers to customers' evaluation of the quality, price, and convenience of a specific service relative to its cost (Lemon et al., 2001). *Relationship equity* refers to 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 focuses on cultivating long-term service relationships with customers beyond the transactional action of immediate purchase (Hao, 2020). However, apart from Lee and Park's (2019) work, there is scant research examining the structural relationships among the three sub-drivers in the hospitality and tourism field. Therefore, this study explores customer equity as a three-dimensional secondary order construct that comprises value, brand, and relationship equity.

*Customer experience (EX)*

Customer experience indicates customers' subjective reactions to a specific service or product during the consumption procedure, with a focus on emotional states (Wong, 2013). It is a multi-structural construct that involves sensory, emotional, cognitive, behavioral, and social values, triggering cognitive, emotional, and behavioral responses (Lee & Park, 2019). Being customer-

centered, the hospitality and tourism industry is characterized by intangible, perishable, inseparable, and simultaneous consumption. Therefore, designing an engaging customer experience is key to business success. Contactless hospitality services create augmented sense-, feel-, think-, act-, and relate-experiences for customers, which in turn leads to customer satisfaction and information sharing (Chen et al., 2021).

There are nine major contactless technologies employed in hotels: voice control, motion-sensing, mobile control, robotic service, thermal sensing, facial recognition, temperature measurement, camera, and 5G network, and IoT (Hao, 2021). According to the equity theory (Adams, 1963), customers consider a good experience as fair when the service encounter creates a balanced input/output ratio, thereby valuing customer equity higher. By contrast, customers may perceive a disappointing experience as unfair because of the unbalanced input/output ratio. As a result, customers' cognitive, social, and behavioral experiences are effective predictors of various dimensions of hotels' brand equity (Lee & Park, 2019; Nuseir, 2020). This study explores the differential roles of customer experience with different contactless technologies in increasing customer equity of the hotel brand among customers with different levels of technology readiness. The following hypothesis is proposed.

**Hypothesis 1**: Customer experience positively influences customer equity for (a) the pooled sample, (b) the high readiness group, and (c) the low readiness group; furthermore, (d) this relationship significantly varies between the high and low readiness groups.

*Customer delight (DE)*

Customer delight is theoretically rooted in the literature on emotions and psychology. It refers to customers' emotional responses to a surprising service with unanticipated satisfaction levels (Oliver et al., 1997). Different from cognitive-driven customer satisfaction, customer delight is an emotion-driven construct that emerges from the combined effect of surprising consumption, arousal, and positive affect (Finn, 2005). Customer delight indicates a higher level of emotional arousal and excitement toward a service brand; thus, it is considered to be the highest state of customer engagement (Torres & Ronzoni, 2018). In the growing affect-driven hospitality and tourism industry, where the cognitive-dominant paradigm is no longer adequate, there is an

increasing demand to cultivate an organizational culture that creates customer delight (Kao et al., 2020).

Hotels with technology-enabled contactless solutions have the potential to offer customers more engaging experiences and an unexpected delighted state of mind; thus, they can add to customers' evaluation of the brand, relationship, and service value (Hao, 2021). They create a better customer experience by allowing customers' psychological safety, adding hedonic value, and improving perceived service quality levels (Li et al., 2021). As the equity theory illustrated (Adams, 1963), a delightful experience contributes to an optimized input/output ratio for customers and adds value to value, brand, and relationship equity. Therefore, creating delighting experiences is crucial for increasing customer equity (Lee & Park, 2019). Based on the equity theory, this study proposes that customer delight can add value to the customer equity of the hotel brand, and the strength of this influence varies among customers with different levels of technology readiness. Thus, the following hypothesis is developed.

**Hypothesis 2**: Customer delight positively influences customer equity for (a) the pooled sample, (b) the high readiness group, and (c) the low readiness group; furthermore, (d) this relationship significantly varies between the high and low readiness groups.

*Brand trust (TR)*

In marketing literature, trust is defined as "the willingness to rely on an exchange partner in whom one has confidence" (Moorman et al., 1993, p. 315). Trust emanates from the confidence that the service provider will perform efficiently so that customers' long-term interests can be serviced (Kim et al., 2001). In the business world, where uncertainty exists, trust is an influential element in social relationships, especially in response to the health risks of the COVID-19 pandemic. In the field of hospitality and tourism, trust underlines transactions during the entire service procedure and shapes brand-customer relationship; therefore, building trust is a critical factor for hospitality firms' business success (Kim et al., 2019; Kim et al., 2020a; Leung & Ma, 2020).

Trust is developed based on customers' experiential processes of learning and their previous interactions with brands (Garbarino & Johnson, 1999). According to equity theory (Adams, 1963), customer equity is inherent with a valuable human capacity that forges trust (Lee

& Park, 2019; Sürücü et al., 2019). Greater customer equity is often associated with competent service value equity, honest and responsible brand equity, and consistent and genuine relationship equity, resulting in a higher level of trust in the invisible consumption (Cho & Jang, 2017; Delgado-Ballester & Munuera-Alemán, 2005; Sürücü et al., 2019). Following this vein, this study proposes that the customer equity of the hotel brand positively influences customers' trust in the brand; further, the different strengths of this path is explored among customers with different levels of technology readiness. The following hypotheses are proposed.

**Hypothesis 3**: Customer equity positively influences brand trust for (a) the pooled sample, (b) the high readiness group, and (c) the low readiness group; furthermore, (d) this relationship significantly varies between the high and low readiness groups.

Notably, because the COVID-19 pandemic has caused fundamental changes in hospitality and tourism management and marketing, the perceived health risk mechanism has begun to play an important role in shaping post-pandemic scenarios (Hao et al., 2020). In the hotel setting, the risk of transmission of infectious diseases such as COVID-19 results in customers' keen attention to the cleanliness and safety of the service environment, which in turn influences customers' trust in the service brand (Jiang & Wen, 2020). With the aid of technological innovation, hotels can effectively apply social distancing and improve customers' perceived cleanliness, thus easing customers' perceived health risks (Shin & Kang, 2020). Therefore, the effect of customer equity on the trust in the service brand may vary among customers with different levels of perceived health risk. Against the backdrop of the pandemic, this study proposes that the health concern of the transmission of infectious diseases, such as COVID-19, moderates the positive relationship between customer equity and brand trust, and thereby the following hypothesis was developed.

**Hypothesis 4**: Health concern strengthens the positive influence of customer equity on trust for (a) the pooled sample, (b) the high readiness group, and (c) the low readiness group; furthermore, (d) this relationship significantly varies between the high and low readiness groups.

The proposed theoretical model is shown in Figure 1.

***[Insert Figure 1 about here]***

## Methodology

*Sample and procedure*

An online survey was designed to test the proposed models. A Hong Kong-based global consultancy company with a 5,190,000-member-sample pool in the Chinese mainland was employed to collect data in January 2021. The Chinese mainland was chosen as the primary research area because it was the first to experience the effects of the SARS-CoV-2 virus, and has gradually recovered since May 2020. Despite the fact that the risk of imported cases remains, and small-scale local outbreaks have occurred in some regions, the pandemic has generally been bought under control, and people's social and economic lives have returned to a certain level of "normality." The current situation in China may present a future scenario for many parts of the world in the coming years (Skegg et al., 2021). In addition, the adoption of contactless technology has gained widespread acceptance in the Chinese hospitality industry; therefore, Chinese customers are generally more familiar with it (Hao et al., 2020).

The criteria for participant recruitment included 1) being adult Chinese citizens; 2) living in one of the ten selected first-tier cities (Table 1); and 3) having previously stayed in a contactless hotel (recognized by Ctrip, Qunar, Mafengwo, and Fliggy) between January 2020 and January 2021. In addition, this study strove to achieve a balanced demographic distribution; therefore, the survey company applied a mixed quota and random sampling method to recruit participants. The company first selected sample groups with relatively balanced quotas of age, gender, income, and geographical distribution, and then randomly invited participation via email.

Six screening questions were employed to filter unwanted participants and focus on the target specifications. The survey took approximately fifteen minutes to complete. After a soft launch with a 200-participant-pilot test, a minor revision was applied to the questionnaire to improve readability and efficiency. In the formal launch stage, 4,847 respondents accessed the questionnaire and 1,600 participants passed the screening questions, completed the survey, and were rewarded at the end. Following the screening of unengaged respondents, 1,537 questionnaires were retained for data analysis. The profiles of the survey participants are presented in Table 1.

***[Insert Table 1 about here]***

*Measurement*

The questionnaire included five major sections (Tables 1, 2, and 3): (1) participants' experience of contactless technologies; (2) participants' evaluation of the delight, equity, and trust related to the latest hotel brand they've stayed at; (3) participants' health concerns regarding the transmission of infectious diseases such as COVID-19; (4) participants' technology readiness; (5) participants' demographic information and travel experience. All items were measured on a seven-point Likert scale. Participants rated their experience quality with nine major contactless technologies. They were then asked to recall their latest experience with a contactless hotel and to rate their delight, equity, and trust in its brand on a seven-point Likert scale. There are four items for delight, extracted from Sweeney et al. (2020); ten items for customer equity, from Vogel et al. (2008); and six items for trust, based on Venkatesh et al. (2012). Health concern was measured by four items taken from Dryhurst et al. (2020), and technology readiness was measured by TRI 2.0, from Walczuch et al. (2007). In addition, participants' demographic information (i.e., gender, age, city, education, occupation, income) and travel experience (travel frequency, hotel scale, and travel companion) were reported as well.

***[Insert Table 2 about here]***

*Technology readiness groups*

TRI 2.0 assesses and categorizes individuals by their propensity to embrace technology in daily life (Table 3). The TRI 2.0 comprises 16 items measuring optimism (positive, 4 items), innovativeness (positive, 4 items), discomfort (negative, 4 items), and insecurity (negative, 4 items). We first reversed the insecurity and discomfort dimensions by subtracting from 8 and then calculated the total TRI 2.0 score by computing the average for the four sums. The TRI 2.0 score ranges from 2.25 to 6.875, and a higher score suggests a higher degree of technology readiness. Considering that the mean value of TRI is 4.64, and the median of TRI is 4.38, 4.5 is set as the threshold TRI to categorize participants into two groups: those with TRI scores equal to and higher than 4.5 are considered the high readiness group (n = 722, 46.97%), and the others are considered the low readiness group (n = 815, 53.03%).

***[Insert Table 3 about here]***

## Results

### *Data analysis*

The PLS-GMA was employed using the SmartPLS 3 software for data analysis. PLS combines principal component analysis and ordinary least squares regressions to evaluate partial model structures (Mateos-Aparicio, 2011). It demonstrates advantages in expanding theoretical frameworks, analyzing complex relationships between latent variables, testing formative constructs, and dealing with secondary data (Hair et al., 2019). PLS was considered suitable to test a complex and exploratory theoretical model with 16 hypotheses. A multi-group analysis was conducted to estimate invariances in parameter estimates between the high and low readiness groups (Sarstedt et al., 2011).

Considering the statistical power of the sample size, Goodhue et al. (2012) argued that the traditional "rule of ten" proposed by Hair et al. (2012)—using ten multiplied by the number of indicators of the most complex latent construct—runs a risk of a statistically significant loss of power. Therefore, we applied G*power with F tests and linear multiple regression (fixed model, $R^2$ deviation from zero) to calculate the minimum sample size. The estimated minimum sample size was 233 with a 0.1 effect size and a 1% probability of error. Thus, the sample size of this study was adequate to achieve significant statistical power.

### *Assessing measurement models*

The latent customer equity (CE) construct contains two-layer structures. Three sub-constructs are reduced to a single-item construct to avoid multicollinearity among the indicators and double-counting. The first-order measurement models were tested separately for the pooled sample as well as the high and low readiness groups. All indicators of customer experience (EX), customer delight (DE), brand equity (BE), value equity (VE), relationship equity (RE), and trust (TR) in the three sample groups were loaded higher than 0.6, indicating adequate variance, as explained by the constructs for exploratory research (Hair et al., 2019). In addition, a bootstrap test with 5,000 subsamples was performed, and all outer loadings were found statistically significant at a 95% confidence level. Factor loadings were considered acceptable.

***[Insert Table 4 about here]***

The average variance extracted (AVE) was examined for convergent validity. All constructs, except for EX, surpassed 0.5; therefore, more than 50% of the variance of indicators was explained by latent constructs; further, convergent validity was good. Considering internal consistency reliability, Cronbach's alpha marks the lower bound, composite reliability signifies the upper bound, and rho_A is deemed as a moderate parameter of internal consistency (Hair et al., 2019). In Table 5, all three sample groups achieved acceptable-to-satisfactory internal consistency reliability. Considering its reliability, the convergent validity of EX was deemed acceptable (Rasoolimanesh et al., 2017).

***[Insert Table 5 about here]***

Discriminant validity was checked according to the Fornell-Larcker criterion (1981). The square root value of the AVE for each construct was greater than the correlation between different latent constructs across the three groups under investigation. All latent constructs are statistically distinct from the others, and good discriminant validity is achieved throughout the proposed models (Table 5).

*Assessing a higher-order model*

The assessment of the higher-order model was conducted following the three-stage approach of higher-order confirmatory factor analysis proposed by Van Riel et al. (2017). First, as demonstrated in the previous section, the measurement model was estimated without a second-order composite. Second, the model was estimated using the second-order construct, CE. For both the pooled sample and the high readiness group, Cronbach's alpha for CE was 0.858, rho_A was 0.862, composite reliability was 0.887, and AVE was 0.541. For the low readiness group, Cronbach's alpha for CE was 0.852, rho_A was 0.853, composite reliability was 0.882, and AVE was 0.529. All high-order models achieved acceptable convergent validity and internal consistency reliability among the three sample groups. In addition, the discriminant validity of the second-

order model was checked using the heterotrait-monotrait (HTMT) ratio of correlations (Henseler et al., 2015). All HTMT were lower than 0.9 and discriminant validity was established (Table 6).

***[Insert Table 6 about here]***

Finally, the model re-estimated the reliability-adjusted single indicators. Consistent path coefficients and confidence intervals were calculated using bootstrapping. As shown in Table 7, relationship equity is the most and value equity is the least influential determinant for all sample groups.

***[Insert Table 7 about here]***

*Assessing structural models*

This study collected data via a single method, therefore, the common method bias was checked as instructed by Podsakoff et al. (2003) and Liang et al. (2007). Results from the Harman one-factor test indicated that the covariance was 29.744% for the pooled sample, 27.645% for the high readiness group, and 29.943% for the low readiness group. The total variance explained by one factor was below the threshold of 50%. Furthermore, a common method factor was introduced into the structural models for double-checking. All indicators under each construct were converted into single-indicator constructs. All squared values of coefficients between each single-indicator construct and its substantive construct surpassed the squared value of the variances of the observed constructs explained by the method factor. Therefore, common method bias was not a major issue.

Following O'brien (2007) and Becker et al. (2015), Cook's distance analysis ($\leq 0.1$), skewness ($\leq 1$), kurtosis ($\leq 1.3$), and variable inflation factor tests ($\leq 3$) of the latent constructs were conducted to check the multivariate assumptions of outliers, normality, and collinearity. Furthermore, scatterplots of the regression standardized residual and the dependent variables were examined to check for homoscedasticity. There was no theoretical support that gender differences may alter the hypothesized relationships. Therefore, configural, metric, and scalar tests were conducted among the female and male groups to validate the factor structure and loading, as well as to ensure that the proposed models attained adequate fit when different groups were tested together and freely (Henseler et al., 2009).

The $R^2$ value calculates the variance explained in every endogenous variable and evaluates the in-sample predictive power (Shmueli & Koppius, 2011). The $R^2$ of CE for the pooled sample, high, and low readiness groups was 0.548, 0.467, and 0.621, respectively, and the $R^2$ of TR for the three groups was 0.489, 0.406, and 0.545, respectively. Following Hair et al. (2011), the proposed models achieved acceptable explanatory power. The square roots of the average squared elements of the residual correlation matrix (SRMR) of 0.057, 0.059, and 0.053, and the NFI values of 0.90, 0.91, and 0.90 for the three models, respectively, represent the structural models explaining the covariation adequately and achieving acceptable goodness-of-fit (Fan et al., 2016).

The results of PLS estimation are shown in Table 8 and Figure 2. The pooled sample indicates that both EX ($\beta = 0.252$) and DE ($\beta = 0.623$) have a significant positive influence on CE, thus supporting H1a and H2a at a significance level of 0.01. The path from CE to TR ($\beta = 0.705$) is significant, which supports H3a. Additionally, after adding health concerns to the model, there is a significant moderating effect ($\beta = 0.066$) on the path between CE and TR. Following Aiken et al. (1991), the interaction effect of CE on TR at both high and low standardized values of health concern is demonstrated in Figure 3. The impact of CE on TR varies significantly across the different levels of the moderator, and the slopes of the path are stronger when the health concern is high. This is in favor of H4a because it indicates that health concerns strengthen the positive effect of CE on TR.

***[Insert Table 8 about here]***

***[Insert Figure 2 about here]***

***[Insert Figure 3 about here]***

*Multi-group analysis*

The multigroup analysis (GMA) is a non-parametric significance assessment of moderation among multiple relationships that tests a single structural model at a time (Matthews, 2017). The working principle of the PLS-GMA is to test the differences among group-specific parameters with

bootstrapping results. The whole sample was divided into two groups: the high readiness group (n = 722) and the low readiness group (n = 815). Each group was subjected to the PLS path model and bootstrapping test (with 5,000 subsamples) to evaluate the robustness of the group estimates separately (Chin, 1998). As demonstrated in Table 8, EX and DE have a significant influence on CE for both high and low readiness groups, and this supports H1b, H1c, H2b, and H2c. In addition, H3b and H3c are supported because CE significantly predicts TR for both groups. However, the moderating effect of health concerns was only significant for the high readiness group. H4b is supported, but there is no significant statistical support for H4c.

The probability of a difference in group-specific results is based on group-specific estimates and empirical cumulative distribution functions (CDFs). The bootstrap estimates are computed as follows:

$$\forall g, j: \qquad \tilde{\theta}_j^{(g)\bar{*}} = \tilde{\theta}_j^{(g)*} - \frac{1}{J}\sum_{i=1}^{J} \tilde{\theta}_i^{(g)*} + \tilde{\theta}^{(g)}.$$

where J is the number of bootstrap samples, and $\tilde{\theta}_j^{(g)*}$ $(j \in \{1, \ldots, J\})$ is the bootstrap estimate. Using the Heaviside step function, H(x) is calculated as follows:

$$H(x) = \frac{1 + \operatorname{sgn}(x)}{2}$$

Taking the bootstrap estimates as discrete manifestations of the CDFs, we can estimate,

$$P\left(\theta^{(1)} \leq \theta^{(2)} \mid \tilde{\theta}^{(1)}, \tilde{\theta}^{(2)}, \mathrm{CDF}(\theta^{(1)}), \mathrm{CDF}(\theta^{(2)})\right) = \frac{1}{J^2}\sum_{i=1}^{J}\sum_{j=1}^{J} H\left(\tilde{\theta}_j^{(2)\bar{*}} - \tilde{\theta}_j^{(1)\bar{*}}\right)$$

The MGA compares each path coefficient across the two groups under investigation to estimate whether any differences in magnitude are statistically significant. Each centered bootstrap estimate of the high readiness group is compared against each centered bootstrap of the low readiness group in the parameter estimates (Table 7). Significant differences in the paths from DE to CE (β = -0.122, p = 0.000) and from CE to TR (β = -0.079, p = 0.036) were found. There were significant variances in the path relationships between the high and low readiness groups.

Although the mean values of EX, DE, CE, and TR for the high readiness group were higher than those for the low readiness group (M_EX*High = 6.10, M_EX*Low = 5.71; M_DE*High = 5.26, M_DE*Low = 5.225; M_CE*High = 5.53, M_CE*Low = 5.29; M_TR*High = 5.60, M_TR*Low = 5.26); DE's influence on CE was higher for the latter (β = 0.705) than for the former (β = 0.583), supporting H2d. An increase in DE induces a higher level of CE for customers who

are less ready to accept new technology, and thus the efforts to create a delightful experience would be more effective in improving value, brand, and relationship equity as a whole.

Similarly, the influence of CE on TR is stronger for the low readiness group ($\beta = 0.729$) than the high readiness group ($\beta = 0.651$), supporting H3d. Compositional invariance is effectively established and produces partial measurement invariance in conjunction with configural invariance (Henseler et al., 2016). However, no significant difference was found in the path from EX to CE, because the correlation between inter-group variable scores was not significantly different from 1. There was no significant statistical proof to confirm H1d.

Further, the positive effect of CE on TR is strengthened by health concerns only for the high readiness group ($\beta = 0.087$), and it does not support H4d. For customers with higher technology readiness, there is an interaction between CE and health concerns with respect to their effect on TR. The standardized coefficient of the estimated interaction relationship was stronger than that of the pooled sample. The moderating effects of health concerns are presented graphically in Figure 4. The slopes of the relationship between CE and TR are weaker at a lower level of health concerns.

***[Insert Figure 4 about here]***

## Discussion and implications

In response to the COVID-19 pandemic, the hospitality and tourism industry has widely adopted technology-enabled contactless services to provide the safest possible experience while maintaining superior service quality. This study explored the antecedents (customer experience and customer delight) and consequences (trust) of customer equity in the context of contactless hospitality services. The moderation effect of health concerns on the path from customer equity to trust was tested. Moreover, since contactless hospitality services require customers to engage with a series of technology-enabled solutions, this study paid specific attention to the invariance among high and low technological readiness of hotel guests.

The major findings of this study are as follows. (1) Customer equity is a higher-order construct that comprises brand, value, and relationship equity. Among them, relationship equity is the most influential determinant, while value equity is least influential. (2) Customers' experience

with the contactless hospitality service has a significant positive influence on customer equity for the pooled sample, the high readiness group, and the low readiness group (all three groups). (3) Customer delight has a significant positive impact on customer equity for all groups under investigation, and this relationship is stronger for the low than for the high readiness group. (4) Customer equity positively predicts customers' trust in the service brand for all groups, and this relationship is stronger for the low readiness group than for the high readiness group. (5) The positive linkage between customer equity and trust is moderated by the health concerns related to COVID-19 for the pooled sample and the high readiness group.

*Theoretical implications*

This study has several theoretical implications. First, its findings contribute to the understanding of contactless service as a technology innovation and creative service design. Contactless services are technology-enabled solutions to provide customers with secure, effective, and pleasant experiences. Although many contactless technologies existed for years, triggered by the pandemic, all technologies are redesigned and reorganized focusing on the contactless feature. Therefore, there are many unexplored issues to be solved, from both service receiver perspective (customers' acceptance of and willingness to pay for the contactless technology) and service provider perspective (hospitality firms' return on investment and service design). This study sets from the service provider perspective to explore the hospitality firms' long-term return on investment, and thus adds to the existing body of knowledge of contactless service. Moreover, service design is a customer-oriented methodology for value co-creation because it brings actors, resources, and technologies together to generate expected value (Font et al., 2021). This study suggests that both experience and delight add value to customer equity, which eventually improves customers' trust in the hotel brand. The findings of this study add more perspective to service design in contactless hospitality service.

Second, this study advances equity theory (Adams, 1963) by bridging customers' technology innovation experience with their evaluation of and long-term relationship with the hospitality brand. Findings of this study present a holistic high-order customer equity model, with experience and delight as antecedents, and brand trust as a consequence. In service encounters, customers' assessments of value, brand, and relationships are often made by their subjective evaluation of the input/output ratio. Different from Hao and Chon (2021), who focused on the

service-oriented experience of contactless hospitality, this study probed deeper into customers' experience of major contactless technologies. The findings of this research are in line with Nuseir (2020), who discovered that customer experience is positively associated with various dimensions of brand equity. In addition to the cognitive experience of contactless service, emotional and hedonic customer delight is also found to shape customers' subjective evaluation processes. Additionally, this study enriches the findings of Lee and Park (2019) by bringing brand trust into the conceptual model; trust is a fundamental human capacity, vital for building social relationships, especially in the context of the COVID-19 pandemic.

Third, this study contributes to the existing body of knowledge on consumer behavior and extends the application of TRI 2.0 to hospitality and tourism research. This is the first multi-group analysis study that segmented participants according to different levels of technology readiness. Customers' readiness for technology in daily life has a spillover effect on their cognitive, emotional, and behavioral responses to other technology-enabled services (Lin et al., 2007; Parasuraman, 2000; Wang et al., 2017). Interestingly, in contrast to existing research (Lin et al., 2007; Victorino et al., 2009; Wang et al., 2017), this study discovered that the effect of customer delight on customer equity and the effect of customer equity on trust are stronger in the low readiness group than in the high readiness group. Once customer delight is achieved, the benefits of contactless service are more obvious among customers with low technology readiness.

*Managerial implications*

This study also has implications for hospitality and tourism marketing and management. First, as the service industry is gradually re-arranging itself around customers rather than products (Zeithaml et al., 2001), managers should form an organizational culture that engenders customer equity by creating a more satisfactory and delightful experience. Second, owing to the unpredictable trajectory of the COVID-19 pandemic, the hospitality and tourism sectors need to determine a solution to coexist with the pandemic. The technology-enabled contactless service should be used as an innovative service designed to protect customers and staff, enhance service efficiency, and create a more delightful experiences through the holistic customer journey. This will not only raise customers' evaluation of the service, brand, and relationship values, but also improve their trust in the service provider.

Notably, customers who are less ready to embrace technology generally have a lower estimation of their experience and delight levels. However, once a certain level of delight is achieved, the lower readiness segment generates higher customer equity, which in turn creates more trust. Therefore, special attention should be paid to designing more delightful contactless interactions for the lower readiness segment. Contactless service should focus more on the "service" rather than the "contactless" attribute, or even make the "contactless" feature invisible. For example, with the support of AI and bigdata, hospitality firms can provide more customized and personalized services that create more surprisingly delightful experiences. The moment customers enter their room, the smart room could have already set their favorite temperature, lighting, and even music. Further, the robotic service should focus on not only fulfilling tasks but also on emotional interaction. Moreover, hospitality firms who focus on lower readiness segments should roll out easy-to-use contactless services and amenities at first. For instance, motion sensors, thermal sensing, and auto temperature measurement require little active engagement and technological skills, and thus easier to be accepted by the lower readiness segment. Accessible contactless services should be provided to the elder customers and those with physical disabilities. It is also important to provide timely assistance from the human staff to reduce customers' anxiety regarding new technologies and their embarrassment from service failure.

*Limitations and directions for future research*

This study has a few limitations and suggestions for future research. First, a single method was adopted to collect and analyze the data. Future studies are encouraged to use more innovative mixed methods, such as the value-adding method (Hao & Xiao, 2021), to conduct a deeper exploration of the phenomena of contactless service. Second, since it is becoming more difficult to predict the future of the hospitality and tourism industry in the context of COVID-19, longitudinal studies are recommended to investigate the proposed theoretical model during different phases of the pandemic. Third, this study collected data from mainland China, where people generally have a more open attitude toward new technologies; therefore, future studies should test the proposed model in a different cultural setting, where customers have different perceptions, experiences, and attitudes toward contactless technology. Fourth, due to the limitations of the study, future studies can enrich the proposed nomological model by introducing more antecedents and consequences (e.g., engagement, loyalty, brand love). Last, service design

workshops are suggested to develop more customer-oriented contactless service prototypes for service co-design and value co-creation.

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Table 1. Profile of survey participants

| Items | Category | Pooled Sample (n=1537) | | High Readiness (n=722) | | Low Readiness (n=815) | |
|---|---|---|---|---|---|---|---|
| | | *f* | % | *f* | % | *f* | % |
| Gender | Male | 870 | 56.6 | 378 | 52.4 | 492 | 60.4 |
| | Female | 667 | 43.4 | 344 | 47.6 | 323 | 39.6 |
| Age | 18– 25 | 196 | 12.8 | 79 | 10.9 | 117 | 14.4 |
| | 26– 35 | 603 | 39.2 | 292 | 40.4 | 311 | 38.2 |
| | 36– 45 | 384 | 25 | 236 | 32.7 | 148 | 18.2 |
| | 46– 55 | 122 | 7.9 | 64 | 8.9 | 58 | 7.1 |
| | 56– 65 | 232 | 15.1 | 51 | 7.0 | 181 | 22.2 |
| City | Beijing | 301 | 19.6 | 155 | 21.5 | 146 | 17.9 |
| | Shanghai | 284 | 18.5 | 159 | 22 | 125 | 15.3 |
| | Guangzhou | 243 | 15.8 | 116 | 16.1 | 127 | 15.6 |
| | Shenzhen | 82 | 5.3 | 38 | 5.3 | 44 | 5.4 |
| | Chengdu | 147 | 9.6 | 59 | 8.2 | 88 | 10.8 |
| | Hangzhou | 111 | 7.2 | 49 | 6.8 | 62 | 7.6 |
| | Wuhan | 82 | 5.3 | 41 | 5.7 | 41 | 5 |
| | Xi'an | 94 | 6.1 | 38 | 5.3 | 56 | 6.9 |
| | Tianjin | 79 | 5.1 | 36 | 5 | 43 | 5.3 |
| | Qingdao | 114 | 7.4 | 31 | 4.3 | 83 | 10.2 |
| Education | High school and below | 85 | 5.6 | 28 | 3.8 | 57 | 7 |
| | Collage | 240 | 15.6 | 90 | 12.5 | 150 | 18.4 |
| | Undergraduate | 1114 | 72.5 | 545 | 75.5 | 569 | 69.8 |
| | Postgraduate | 98 | 6.4 | 59 | 8.2 | 39 | 4.8 |
| Occupation | Civic servant | 214 | 13.9 | 80 | 11.1 | 134 | 16.4 |
| | Teacher | 39 | 2.5 | 11 | 1.5 | 28 | 3.4 |
| | Business managers | 796 | 51.8 | 448 | 62 | 348 | 42.7 |
| | Workers | 46 | 3 | 18 | 2.5 | 28 | 3.4 |
| | Self-employed | 118 | 7.7 | 59 | 8.2 | 59 | 7.2 |
| | Freelancers | 89 | 5.8 | 34 | 4.7 | 55 | 6.7 |
| | Full-time student | 25 | 1.6 | 15 | 2.1 | 10 | 1.2 |
| | Retired | 96 | 6.2 | 12 | 1.7 | 84 | 10.3 |
| | Other | 114 | 7.4 | 45 | 6.2 | 69 | 8.5 |
| Income (RMB) | 0–6,000 | 27 | 1.7 | 12 | 1.6 | 15 | 1.8 |
| | 6,001–10,000 | 122 | 7.9 | 47 | 6.5 | 75 | 9.2 |
| | 10,001–20,000 | 740 | 48.1 | 283 | 39.2 | 457 | 56.1 |
| | 20,001–30,000 | 485 | 31.6 | 274 | 38 | 211 | 25.9 |
| | 30,001 and above | 163 | 10.6 | 106 | 14.7 | 57 | 7.0 |
| Frequency | 1-3 nights | 257 | 16.7 | 90 | 12.5 | 167 | 20.5 |
| | 4-10 nights | 823 | 53.5 | 358 | 49.6 | 465 | 57.1 |
| | 11 nights and above | 457 | 29.7 | 274 | 38 | 183 | 22.5 |
| Price (RMB) | 0-300 | 99 | 6.4 | 45 | 6.2 | 54 | 6.6 |
| | 301-600 | 683 | 44.4 | 307 | 42.5 | 376 | 46.1 |
| | 601-900 | 532 | 34.6 | 252 | 34.9 | 280 | 34.4 |
| | 901-1,200 | 191 | 12.4 | 103 | 14.3 | 88 | 10.8 |
| | 1,201 and above | 32 | 2.1 | 15 | 2.1 | 17 | 2.1 |
| Travel companion | No travel companion | 456 | 29.7 | 190 | 26.3 | 266 | 32.6 |
| | Friends and/or relatives | 289 | 18.8 | 107 | 14.8 | 182 | 22.3 |
| | Partner without child(ren) | 483 | 31.4 | 237 | 32.8 | 246 | 30.2 |
| | Partner and/or child(ren) | 309 | 20.1 | 188 | 26.0 | 121 | 14.9 |

Table 2. Descriptive statistics of indicators

| Items | Pooled Sample (n=1537) | | | | High Readiness (n=722) | | | | Low Readiness (n=815) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | SD | SK | KU | M | SD | SK | KU | M | SD | SK | KU |
| EX1. Voice control | 5.95 | 0.97 | -1 | 1.93 | 6.2 | 0.82 | -0.8 | 0.43 | 5.73 | 1.03 | -1 | 2.01 |
| EX2. Motion-sensing | 5.88 | 0.95 | -0.8 | 1.19 | 6.07 | 0.89 | -0.9 | 1.35 | 5.72 | 0.96 | -0.7 | 1.21 |
| EX3. Mobile control | 6.04 | 0.94 | -1 | 1.65 | 6.34 | 0.79 | -1 | 0.48 | 5.78 | 0.99 | -0.9 | 1.86 |
| EX4. Robotic service | 5.92 | 0.97 | -1 | 1.99 | 6.11 | 0.89 | -1.2 | 2.6 | 5.76 | 1.01 | -0.9 | 1.69 |
| EX5. Thermal sensing | 5.91 | 0.92 | -0.6 | -0.2 | 6.09 | 0.86 | -0.6 | -0.3 | 5.75 | 0.95 | -0.5 | -0.2 |
| EX6. Facial recognition | 5.77 | 1.14 | -1.2 | 2.38 | 6.01 | 1.12 | -1.4 | 2.55 | 5.55 | 1.13 | -1.2 | 2.74 |
| EX7. Auto temperature measurement | 5.99 | 0.99 | -1.1 | 2.25 | 6.23 | 0.89 | -1.5 | 4.46 | 5.78 | 1.02 | -0.9 | 1.48 |
| EX8. Camera | 5.57 | 1.13 | -0.9 | 1.48 | 5.56 | 1.18 | -0.9 | 1.02 | 5.58 | 1.08 | -1 | 1.99 |
| EX9. 5G network and IoT | 6.03 | 0.95 | -1.1 | 2.21 | 6.32 | 0.84 | -1.5 | 3.63 | 5.77 | 0.98 | -0.9 | 2.03 |
| DE1. This hotel offers me things I never expected. | 5.44 | 1.05 | -0.6 | 0.64 | 5.61 | 1.03 | -0.7 | 0.96 | 5.3 | 1.05 | -0.5 | 0.57 |
| DE2. What this hotel does, often exceeds my wildest expectations. | 4.98 | 1.27 | -0.6 | 0.29 | 4.81 | 1.33 | -0.5 | 0.11 | 5.13 | 1.18 | -0.6 | 0.35 |
| DE3. This hotel frequently performs beyond my expectations. | 5.35 | 1.04 | -0.6 | 0.58 | 5.47 | 1 | -0.7 | 1.13 | 5.24 | 1.06 | -0.5 | 0.24 |
| DE4. I am often surprised by the things this hotel can do. | 5.19 | 1.13 | -0.6 | 0.34 | 5.15 | 1.2 | -0.6 | 0.26 | 5.23 | 1.07 | -0.5 | 0.31 |
| VE1. I stay with this hotel because both (this hotel and I) can earn a profit from it. | 5.11 | 1.27 | -0.8 | 0.78 | 5.05 | 1.34 | -0.8 | 0.68 | 5.17 | 1.19 | -0.7 | 0.72 |
| VE2. I want to keep working with this hotel because it is difficult to find other hotels like it. | 5.25 | 1.12 | -0.5 | 0.51 | 5.24 | 1.16 | -0.6 | 0.31 | 5.26 | 1.08 | -0.5 | 0.7 |
| VE3. I am happy with the service received from this hotel. | 5.58 | 1.01 | -0.6 | 0.47 | 5.84 | 0.92 | -0.7 | 1.03 | 5.35 | 1.02 | -0.4 | 0.28 |
| BE1. I pay a lot of attention to everything about this hotel. | 5.41 | 1.08 | -0.5 | 0.05 | 5.55 | 1.02 | -0.5 | 0.11 | 5.29 | 1.11 | -0.5 | -0 |
| BE2. Everything related to this hotel grabs my interest. | 5.39 | 1.06 | -0.4 | -0.1 | 5.57 | 1.05 | -0.6 | 0.37 | 5.23 | 1.04 | -0.3 | -0.3 |
| BE3. I identify myself with the values that this hotel represents for me. | 5.37 | 1.09 | -0.5 | 0.3 | 5.49 | 1.06 | -0.6 | 0.35 | 5.27 | 1.11 | -0.4 | 0.28 |
| RE1. I have trust in this hotel for hiring a financial service. | 5.59 | 0.98 | -0.6 | 0.51 | 5.78 | 0.93 | -0.7 | 0.87 | 5.41 | 0.99 | -0.5 | 0.37 |
| RE2. I feel this hotel is close to me. | 5.45 | 1.04 | -0.5 | 0.08 | 5.59 | 1.03 | -0.6 | 0.19 | 5.33 | 1.02 | -0.4 | 0.08 |
| RE3. I think this hotel makes several investments to improve our relationship. | 5.46 | 1.08 | -0.7 | 0.75 | 5.66 | 1.02 | -0.7 | 0.89 | 5.28 | 1.1 | -0.6 | 0.74 |
| RE4. I perceive that this hotel makes an effort to improve our relationship. | 5.52 | 1 | -0.4 | 0.08 | 5.72 | 0.96 | -0.5 | -0.2 | 5.35 | 1.01 | -0.4 | 0.24 |
| TR1. I believe that this hotel is trustworthy. | 5.55 | 1.03 | -0.6 | 0.53 | 5.81 | 0.91 | -0.6 | 0.59 | 5.32 | 1.07 | -0.5 | 0.37 |
| TR2. I trust in this hotel. | 5.49 | 1.05 | -0.6 | 0.32 | 5.76 | 0.96 | -0.8 | 0.98 | 5.25 | 1.08 | -0.4 | 0.07 |
| TR3. I do not doubt the honesty of this hotel. | 5.26 | 1.13 | -0.6 | 0.56 | 5.34 | 1.15 | -0.7 | 0.79 | 5.19 | 1.11 | -0.6 | 0.39 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TR4. I feel assured that legal and technological structures adequately protect me from problems with this hotel. | 5.36 | 1.12 | -0.6 | 0.5 | 5.48 | 1.07 | -0.6 | 0.32 | 5.24 | 1.15 | -0.7 | 0.54 |
| TR5. Even if not monitored I trust this hotel to do the job right. | 5.34 | 1.1 | -0.7 | 0.81 | 5.46 | 1.08 | -0.7 | 0.84 | 5.24 | 1.11 | -0.7 | 0.82 |
| TR6. This hotel has the ability to fulfil its task | 5.56 | 1 | -0.6 | 0.59 | 5.79 | 0.9 | -0.7 | 1.38 | 5.36 | 1.04 | -0.4 | 0.27 |

Note. 1. M = Mean; SD = Standard deviation; SK = Skewness; KU = Kurtosis.
2. EX = customers' experience of contactless technologies; DE = customer delight; VE = value equity; BE = brand equity; RE = relationship equity; TR = brand trust.
3. Boldface values highlight absolute value of Skewness or Kurtosis of indicators is larger than 1, which indicate distribution issues.

Table 3. Technology Readiness Index 2.0

| Technology readiness index | M | SD | SK | KU |
|---|---|---|---|---|
| OPT1. New technologies contribute to a better quality of life. | 4.15 | 0.71 | -0.83 | 1.12 |
| OPT2. Technology gives me more freedom of mobility. | 4.08 | 0.70 | -0.81 | 1.32 |
| OPT3. Technology gives people more control over their daily lives. | 3.97 | 0.74 | -0.87 | 1.42 |
| OPT4. Technology makes me more productive in my personal life. | 4.16 | 0.71 | -0.69 | 0.40 |
| INN1. Other people come to me for advice on new technologies. | 3.67 | 0.81 | -0.69 | 0.68 |
| INN2. In general, I am among the first in my circle of friends to acquire new technology when it appears. | 3.69 | 0.87 | -0.73 | 0.64 |
| INN3. I can usually figure out new high-tech products and services without help from others. | 3.89 | 0.76 | -0.73 | 0.98 |
| INN4. I keep up with the latest technological developments in my areas of interest. | 4.03 | 0.73 | -0.69 | 0.78 |
| DIS1. When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being taken advantage of by someone who knows more than I do | 3.17 | 1.13 | -0.41 | -0.69 |
| DIS2. Technical support lines are not helpful because they don't explain things in terms I understand | 3.06 | 1.17 | -0.25 | -0.91 |
| DIS3. Sometimes, I think that technology systems are not designed for use by ordinary people | 2.89 | 1.21 | -0.15 | -1.03 |
| DIS4. There is no such thing as a manual for a high-tech product or service that's written in plain language | 2.81 | 1.24 | -0.02 | -1.15 |
| INS1. People are too dependent on technology to do things for them | 3.23 | 1.11 | -0.41 | -0.65 |
| INS2. Too much technology distracts people to a point that is harmful | 2.90 | 1.21 | -0.12 | -1.03 |
| INS3. Technology lowers the quality of relationships by reducing personal interaction | 3.20 | 1.13 | -0.37 | -0.75 |
| INS4. I do not feel confident doing business with a place that can only be reached online | 2.93 | 1.20 | -0.12 | -0.98 |
| Technology Readiness Index (TRI) 2.0 | 3.32 | 0.56 | 0.56 | -0.54 |

Note. 1. M = Mean; SD = Standard deviation; SK = Skewness; KU = Kurtosis. OPT = Optimism towards technology; INN = Innovativeness towards technology; DIS = Discomfort towards technology; INS = Insecurity towards technology.
2. These questions comprise the Technology Readiness Index 2.0 which is copyrighted by A. Parasuraman and Rockbridge Associates, Inc., 2014. This scale may be duplicated only with written permission from the authors. TRI 2.0= (Innovative + Optimism + (8-Insecurity) + (8-Discomfort))/4

Table 4. Indicator loadings

| | Pooled Sample (n=1537) | | | | | High Readiness (n=722) | | | | | Low Readiness (n=815) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Items | Loading | *t* | *p* | 2.5% | 97.5% | Loading | *t* | *p* | 2.5% | 97.5% | Loading | *t* | *p* | 2.5% | 97.5% |
| EX1 | 0.683 | 31.021 | 0.000 | 0.637 | 0.724 | 0.629 | 20.912 | 0.000 | 0.548 | 0.695 | 0.673 | 20.899 | 0.000 | 0.603 | 0.731 |
| EX2 | 0.626 | 26.175 | 0.000 | 0.577 | 0.672 | 0.625 | 19.245 | 0.000 | 0.553 | 0.681 | 0.603 | 18.001 | 0.000 | 0.509 | 0.660 |
| EX3 | 0.673 | 30.899 | 0.000 | 0.603 | 0.689 | 0.629 | 20.912 | 0.000 | 0.441 | 0.607 | 0.653 | 21.074 | 0.000 | 0.585 | 0.705 |
| EX4 | 0.602 | 21.743 | 0.000 | 0.543 | 0.651 | 0.661 | 23.824 | 0.000 | 0.470 | 0.633 | 0.608 | 19.271 | 0.000 | 0.507 | 0.674 |
| EX5 | 0.631 | 28.330 | 0.000 | 0.584 | 0.670 | 0.623 | 16.363 | 0.000 | 0.542 | 0.686 | 0.603 | 18.001 | 0.000 | 0.531 | 0.663 |
| EX6 | 0.629 | 28.718 | 0.000 | 0.586 | 0.672 | 0.602 | 13.947 | 0.000 | 0.487 | 0.648 | 0.647 | 20.841 | 0.000 | 0.585 | 0.704 |
| EX7 | 0.640 | 27.797 | 0.000 | 0.591 | 0.684 | 0.650 | 21.899 | 0.000 | 0.564 | 0.716 | 0.609 | 19.237 | 0.000 | 0.504 | 0.639 |
| EX8 | 0.688 | 31.675 | 0.000 | 0.457 | 0.573 | 0.602 | 13.947 | 0.000 | 0.458 | 0.630 | 0.605 | 18.452 | 0.000 | 0.489 | 0.647 |
| EX9 | 0.695 | 33.465 | 0.000 | 0.647 | 0.724 | 0.635 | 19.564 | 0.000 | 0.565 | 0.693 | 0.671 | 21.144 | 0.000 | 0.602 | 0.725 |
| BE1 | 0.790 | 68.154 | 0.000 | 0.766 | 0.812 | 0.813 | 50.985 | 0.000 | 0.778 | 0.840 | 0.765 | 43.982 | 0.000 | 0.730 | 0.797 |
| BE2 | 0.795 | 67.235 | 0.000 | 0.770 | 0.817 | 0.823 | 59.360 | 0.000 | 0.794 | 0.847 | 0.758 | 36.104 | 0.000 | 0.711 | 0.794 |
| BE3 | 0.775 | 64.884 | 0.000 | 0.751 | 0.798 | 0.795 | 51.731 | 0.000 | 0.763 | 0.823 | 0.759 | 41.602 | 0.000 | 0.721 | 0.792 |
| DE1 | 0.755 | 57.254 | 0.000 | 0.728 | 0.780 | 0.795 | 49.880 | 0.000 | 0.763 | 0.825 | 0.704 | 29.835 | 0.000 | 0.656 | 0.746 |
| DE2 | 0.722 | 41.443 | 0.000 | 0.686 | 0.754 | 0.747 | 30.761 | 0.000 | 0.694 | 0.790 | 0.753 | 40.146 | 0.000 | 0.713 | 0.786 |
| DE3 | 0.734 | 45.143 | 0.000 | 0.701 | 0.764 | 0.749 | 30.305 | 0.000 | 0.696 | 0.791 | 0.705 | 31.390 | 0.000 | 0.659 | 0.746 |
| DE4 | 0.727 | 42.325 | 0.000 | 0.691 | 0.756 | 0.706 | 26.980 | 0.000 | 0.651 | 0.751 | 0.757 | 37.500 | 0.000 | 0.713 | 0.793 |
| RE1 | 0.731 | 48.078 | 0.000 | 0.700 | 0.759 | 0.754 | 37.694 | 0.000 | 0.712 | 0.790 | 0.692 | 27.840 | 0.000 | 0.639 | 0.738 |
| RE2 | 0.764 | 55.961 | 0.000 | 0.736 | 0.790 | 0.795 | 46.336 | 0.000 | 0.758 | 0.826 | 0.732 | 35.988 | 0.000 | 0.689 | 0.770 |
| RE3 | 0.731 | 48.675 | 0.000 | 0.701 | 0.760 | 0.722 | 29.481 | 0.000 | 0.669 | 0.766 | 0.720 | 34.589 | 0.000 | 0.678 | 0.759 |
| RE4 | 0.747 | 53.029 | 0.000 | 0.718 | 0.774 | 0.757 | 36.928 | 0.000 | 0.714 | 0.794 | 0.721 | 34.120 | 0.000 | 0.678 | 0.759 |
| TR1 | 0.717 | 52.593 | 0.000 | 0.707 | 0.762 | 0.745 | 34.376 | 0.000 | 0.697 | 0.784 | 0.702 | 33.279 | 0.000 | 0.656 | 0.741 |
| TR2 | 0.706 | 51.658 | 0.000 | 0.700 | 0.755 | 0.738 | 33.943 | 0.000 | 0.690 | 0.776 | 0.692 | 32.100 | 0.000 | 0.647 | 0.731 |
| TR3 | 0.754 | 42.135 | 0.000 | 0.682 | 0.747 | 0.707 | 23.989 | 0.000 | 0.638 | 0.758 | 0.737 | 39.598 | 0.000 | 0.699 | 0.771 |
| TR4 | 0.721 | 35.720 | 0.000 | 0.643 | 0.718 | 0.647 | 19.956 | 0.000 | 0.579 | 0.706 | 0.708 | 29.493 | 0.000 | 0.658 | 0.752 |
| TR5 | 0.685 | 40.633 | 0.000 | 0.662 | 0.728 | 0.737 | 34.706 | 0.000 | 0.691 | 0.777 | 0.665 | 24.431 | 0.000 | 0.606 | 0.713 |
| TR6 | 0.671 | 36.378 | 0.000 | 0.632 | 0.706 | 0.676 | 23.932 | 0.000 | 0.613 | 0.725 | 0.636 | 23.426 | 0.000 | 0.582 | 0.685 |
| VE1 | 0.725 | 22.422 | 0.000 | 0.566 | 0.676 | 0.706 | 13.876 | 0.000 | 0.515 | 0.682 | 0.705 | 24.265 | 0.000 | 0.635 | 0.748 |
| VE2 | 0.750 | 38.201 | 0.000 | 0.706 | 0.784 | 0.708 | 18.051 | 0.000 | 0.609 | 0.762 | 0.808 | 53.173 | 0.000 | 0.776 | 0.835 |
| VE3 | 0.788 | 54.474 | 0.000 | 0.759 | 0.814 | 0.821 | 36.012 | 0.000 | 0.774 | 0.866 | 0.725 | 29.147 | 0.000 | 0.672 | 0.769 |

Table 5. Assessing reflective measurement models

| **Pooled Sample (n=1537)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | a | rho_A | CR | AVE | BE | DE | EX | RE | TR | VE |
| BE | 0.692 | 0.692 | 0.83 | 0.619 | **0.787** | | | | | |
| DE | 0.718 | 0.722 | 0.824 | 0.539 | 0.622 | **0.734** | | | | |
| EX | 0.811 | 0.816 | 0.857 | 0.429 | 0.361 | 0.294 | **0.655** | | | |
| RE | 0.731 | 0.731 | 0.832 | 0.553 | 0.691 | 0.625 | 0.422 | **0.744** | | |
| TR | 0.777 | 0.778 | 0.848 | 0.528 | 0.603 | 0.525 | 0.391 | 0.627 | **0.727** | |
| VE | 0.609 | 0.615 | 0.768 | 0.524 | 0.614 | 0.563 | 0.368 | 0.655 | 0.538 | **0.724** |
| **High Readiness (n=722)** | | | | | | | | | | |
| | a | rho_A | CR | AVE | BE | DE | EX | RE | TR | VE |
| BE | 0.739 | 0.74 | 0.852 | 0.657 | **0.810** | | | | | |
| DE | 0.744 | 0.758 | 0.837 | 0.562 | 0.685 | **0.750** | | | | |
| EX | 0.775 | 0.775 | 0.833 | 0.407 | 0.346 | 0.354 | **0.621** | | | |
| RE | 0.752 | 0.757 | 0.843 | 0.573 | 0.662 | 0.702 | 0.394 | **0.757** | | |
| TR | 0.780 | 0.784 | 0.85 | 0.532 | 0.611 | 0.653 | 0.349 | 0.636 | **0.730** | |
| VE | 0.544 | 0.600 | 0.772 | 0.633 | 0.628 | 0.604 | 0.376 | 0.672 | 0.592 | **0.712** |
| **Low Readiness (n=815)** | | | | | | | | | | |
| | a | rho_A | CR | AVE | BE | DE | EX | RE | TR | VE |
| BE | 0.636 | 0.636 | 0.804 | 0.578 | **0.761** | | | | | |
| DE | 0.707 | 0.709 | 0.820 | 0.533 | 0.685 | **0.730** | | | | |
| EX | 0.795 | 0.805 | 0.846 | 0.444 | 0.346 | 0.354 | **0.666** | | | |
| RE | 0.684 | 0.684 | 0.808 | 0.513 | 0.662 | 0.702 | 0.394 | **0.716** | | |
| TR | 0.763 | 0.764 | 0.841 | 0.514 | 0.611 | 0.653 | 0.349 | 0.636 | **0.717** | |
| VE | 0.633 | 0.653 | 0.787 | 0.553 | 0.628 | 0.604 | 0.376 | 0.672 | 0.592 | **0.744** |

Note. 1. a = Cronbach's alpha; rho_A = Joreskog's rho; CR= composite reliability; AVE = average variance extracted.
2. Boldface values show the square roots of AVE.

Table 6. The heterotrait-monotrait (HTMT) ratio of second-order composite

| **Pooled Sample (n=1537)** | | | |
|---|---|---|---|
| CE | CE | DE | EX |
| DE | 0.889 | | |
| EX | 0.517 | 0.381 | |
| TR | 0.839 | 0.704 | 0.508 |
| | | | |
| **High Readiness (n=722)** | | | |
| CE | CE | DE | EX |
| DE | 0.796 | | |
| EX | 0.451 | 0.325 | |
| TR | 0.752 | 0.52 | 0.462 |
| | | | |
| **Low Readiness (n=815)** | | | |
| CE | CE | DE | EX |
| DE | 0.892 | | |
| EX | 0.513 | 0.468 | |
| TR | 0.897 | 0.801 | 0.462 |

Table 7. Secondary order models

| | **Pooled Sample (n=1537)** | | | | **High Readiness (n=722)** | | | | **Low Readiness (n=815)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Items | First-order | | Second-order | | First-order | | Second-order | | First-order | | Second-order | |
| | *β* | *t* | *β* | *t* | *β* | *t* | *β* | *t* | *β* | *t* | *β* | *t* |
| BE1 | 0.790 | 68.154 | | | 0.813 | 50.985 | | | 0.765 | 43.982 | | |
| BE2 | 0.795 | 67.235 | 0.370 | 52.993 | 0.823 | 59.36 | 0.389 | 38.241 | 0.758 | 36.104 | 0.351 | 36.348 |
| BE3 | 0.775 | 64.884 | | | 0.795 | 51.731 | | | 0.759 | 41.602 | | |
| RE1 | 0.731 | 48.078 | | | 0.754 | 37.694 | | | 0.692 | 27.840 | | |
| RE2 | 0.764 | 55.961 | 0.459 | 64.376 | 0.795 | 46.336 | 0.470 | 44.25 | 0.732 | 35.988 | 0.434 | 43.586 |
| RE3 | 0.731 | 48.675 | | | 0.722 | 29.481 | | | 0.720 | 34.589 | | |
| RE4 | 0.747 | 53.029 | | | 0.757 | 36.928 | | | 0.721 | 34.120 | | |
| VE1 | 0.725 | 22.422 | | | 0.706 | 13.876 | | | 0.705 | 24.265 | | |
| VE2 | 0.750 | 38.201 | 0.302 | 43.478 | 0.708 | 18.051 | 0.278 | 28.065 | 0.808 | 53.173 | 0.342 | 35.944 |
| VE3 | 0.788 | 54.474 | | | 0.821 | 36.012 | | | 0.725 | 29.147 | | |

Table 8. Multi-group invariance

| Path | **a. Pooled Sample (n=1537)** | | | **b. High Readiness (n=722)** | | | **c. Low Readiness (n=815)** | | | **d. Diff (Low - High)** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *β* | *t* | *p* | *β* | *t* | *p* | *β* | *t* | *p* | *β* | *t* | *p* |
| H1: EX-> CE | **0.252** | 12.516 | 0.000 | **0.238** | 8.244 | 0.000 | **0.180** | 7.170 | 0.000 | 0.058 | 0.068 | 0.136 |
| H2: DE-> CE | **0.623** | 31.279 | 0.000 | **0.583** | 19.548 | 0.000 | **0.705** | 31.435 | 0.000 | **-0.122** | 1.000 | 0.000 |
| H3: CE -> TR | **0.705** | 38.343 | 0.000 | **0.651** | 21.287 | 0.000 | **0.729** | 32.845 | 0.000 | **-0.079** | 0.982 | 0.036 |
| H4: Moderating | **0.066** | 2.591 | 0.010 | **0.087** | 2.169 | 0.030 | 0.041 | 1.336 | 0.182 | 0.046 | 0.178 | 0.356 |

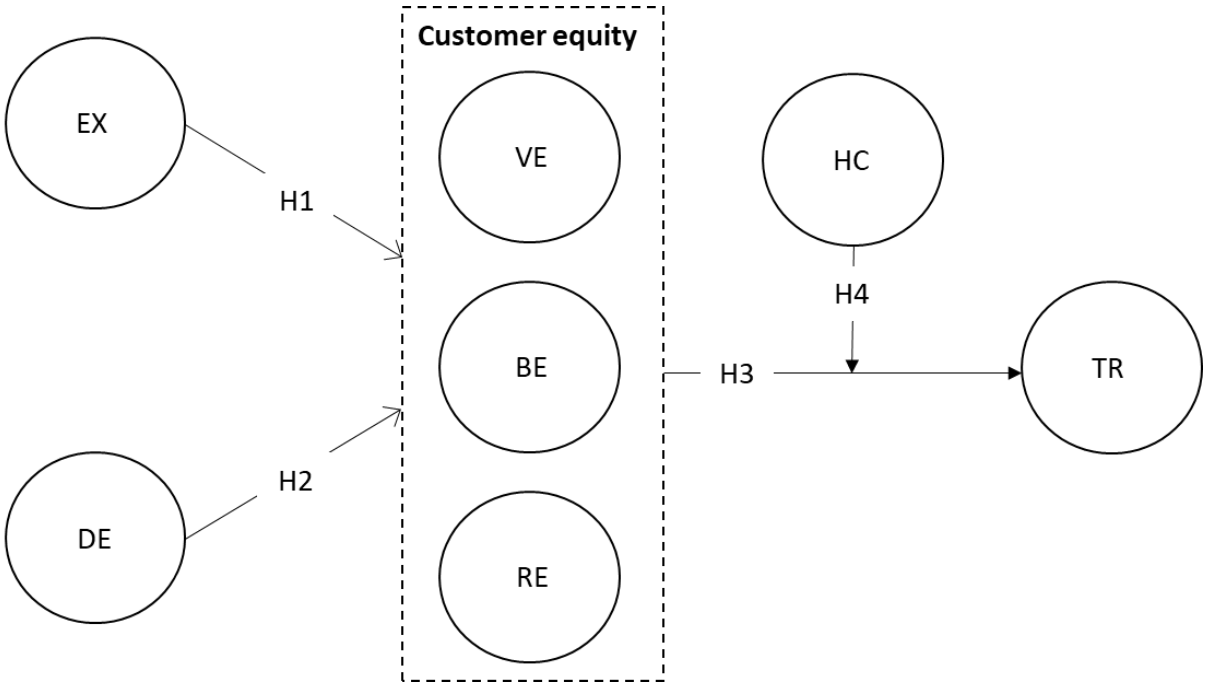


Figure 1. Hypothesized conceptual framework

Note: EX = customers' experience of contactless technologies; DE = customer delight; VE = value equity; BE = brand equity; RE = relationship equity; HC = health concern; TR = brand trust.

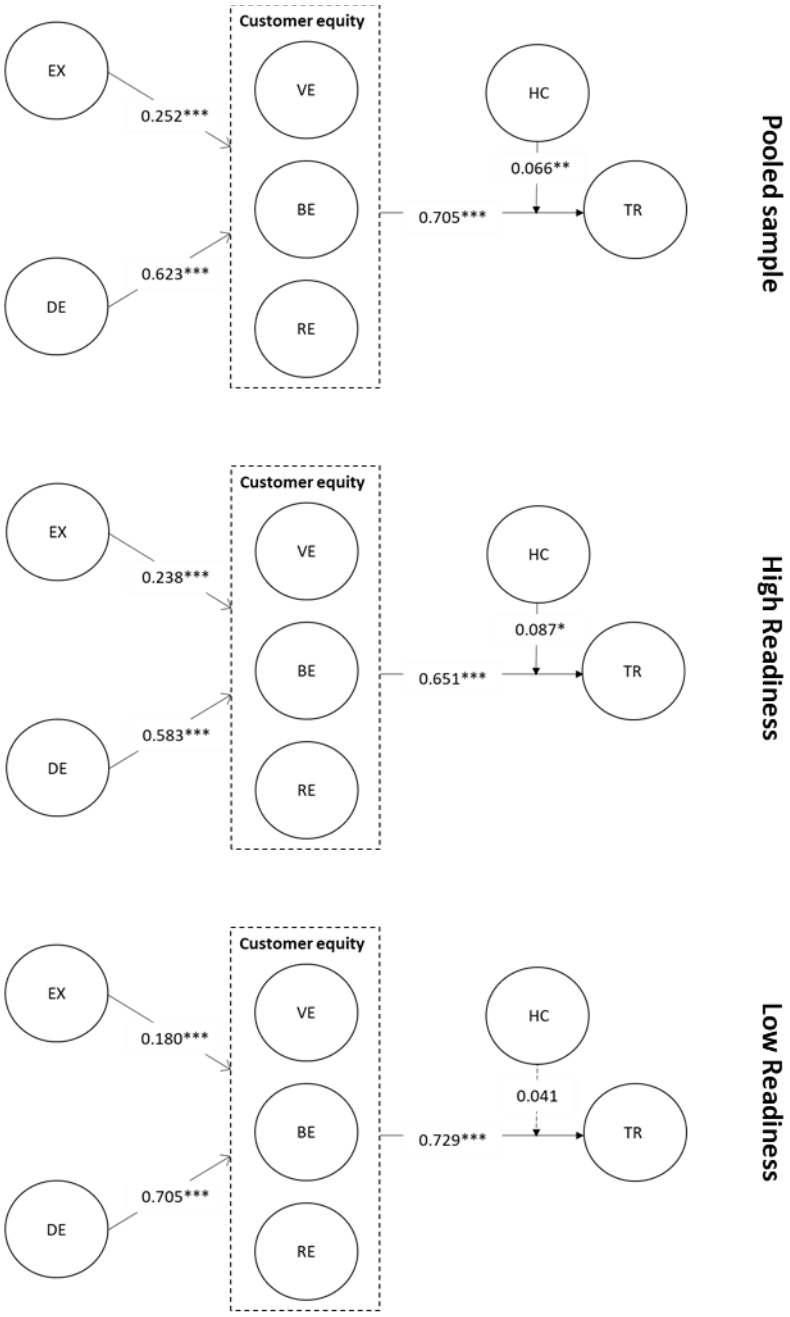


Figure 2. Results of PLS modeling

Note: EX = customers' experience of contactless technologies; DE = customer delight; VE = value equity; BE = brand equity; RE = relationship equity; HC = health concern; TR = brand trust.
* P ⩽ 0.05, ** P ⩽ 0.01, *** P ⩽ 0.001

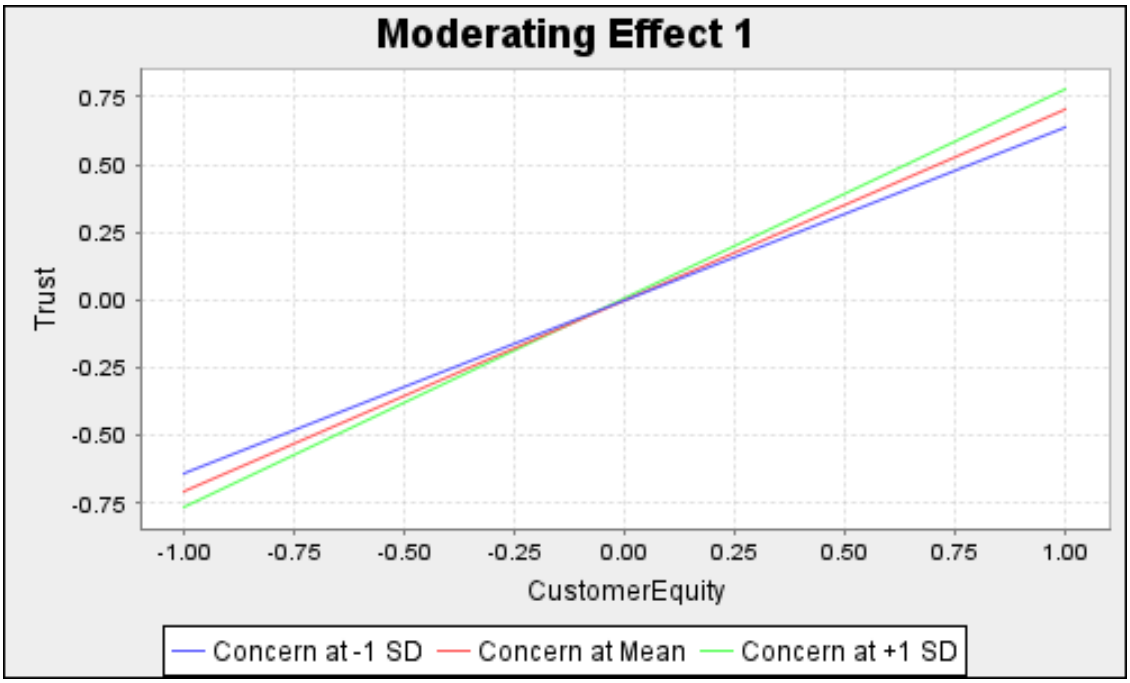


Figure 3. Moderating effect of CE on trust TR via health concern (Pooled Sample)

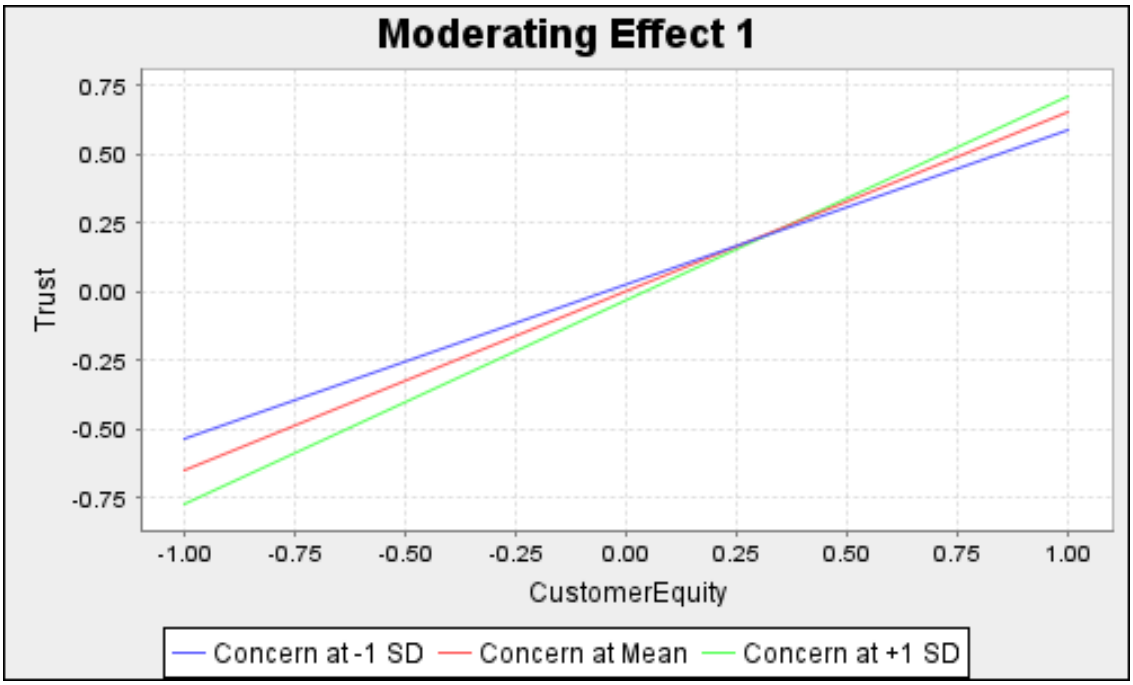


Figure 4. Moderating effect of CE on trust TR via health concern (High Readiness)