

Article

Moderating Effect of Gender on the Relationship between Technology Readiness Index and Consumers' Continuous Use Intention of Self-Service Restaurant Kiosks

Tae-Kyun Na ¹, Sun-Ho Lee ^{2,*} and Jae-Yeon Yang ^{3,*}¹ Department of Culinary Arts, University of Doowon, Paju 10838, Korea; food@doowon.ac.kr² Department of Foodservice & Culinary Arts, University of Honam, Gwangju 62399, Korea³ Department of Hotel & Tourism, University of Doowon, Paju 10838, Korea

* Correspondence: shlee@honam.ac.kr (S.-H.L.); yang@doowon.ac.kr (J.-Y.Y.)

Abstract: This study aims to analyze the moderating effect of gender on the relationship between technology readiness and willingness to continue using self-service kiosks in fast-food restaurants among middle-aged and older consumers. We conducted a survey from 1 May to 30 May 2020 among 320 consumers born in or before 1980 who only used kiosks in fast-food restaurants. The findings are as follows: First, the more innovative and optimistic the consumer, the more they are willing to continue using kiosks, whereas the more discomfort the consumer feels, the less likely they are to continue using them. Second, among technology readiness factors, a sense of insecurity does not have a significant effect on the willingness to continue to use kiosks. Third, among innovative consumers, men were found to be more likely to continue using kiosks than women. Thus, fast-food restaurant managers need to know that men and women perceive technology-based self-service differently.

Keywords: continuous use intention; gender; self-service kiosk; technology-based self-service; technology readiness index



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1. Introduction

Traditional service encounters are face-to-face, direct interactions between customers and service employees. However, with the development of technology, such encounters are increasingly being replaced by technology-based self-services (TBSSs), where customers interact with technology instead [1,2]. Initially, companies adopting TBSSs targeted specific consumers. However, TBSSs have become increasingly popular, thus allowing companies to attract a broader consumer base [3].

In particular, the self-service kiosk, which is an unmanned payment system where customers can search, order, and pay for items on the menu, is the TBSS type most rapidly increasing in use in South Korea. A report [4] on the 2019 foodservice trends in Korea revealed that the proportion of consumers who knew about kiosks increased by 33.7% from 20.0% in 2017 to 53.7% in 2019. The proportion of those who have experienced using kiosks when eating in restaurants increased from 42.9% in 2017 to 71.9% in 2019, with most of them (76.3%) having dined in fast-food restaurants. Survey respondents pointed out that the dining and drinking places where self-service kiosks could be installed in the future were, in descending order, school or company cafeterias, bars, and coffee shops.

However, the above-mentioned report [4] on the foodservice trends in Korea in 2019 revealed that some consumers were not satisfied with the use of kiosks. The following are some of the responses from the report's survey: "kiosk is more inconvenient than face-to-face service" (61.1%); "I am not good at using the machine" (53.3%); and "the machine frequently makes errors" (29.6%). Many rapidly developing cutting-edge technologies have permeated every aspect of life, some consumers have difficulty in adjusting to the speed of technological changes [5]. The "digital divide", which refers to the economic and

social inequality between people who can and cannot easily access and use digital media, has become a social problem [6,7]. On the one hand, digital natives, who were born in and are already exposed to various digital environments, do not feel any discomfort or insecurity when adopting new technologies [8]. On the other hand, digital immigrants, who have to adjust to new digital environments with the transition from analog to digital, may experience greater discomfort and insecurity. Therefore, in order to reduce the digital divide among middle-aged consumers who are not as regularly exposed to digital media, it is necessary to study how the consumer's innovation propensity, optimism, discomfort, and insecurity about new technologies affect the acceptance of new technologies. To check if consumers are ready to accept new technologies, Parasuraman [9] suggested using a Technology Readiness Index (TRI). Many studies have identified that a higher positive TRI and lower negative TRI, means that the person is more likely to accept the new technology [10–12].

Also, it would be meaningful to investigate what personal characteristics would influence the formation of attitudes to TBSS. Livingstone et al. [13] suggested gender, age, socio-economic status, disability, race, and linguistic proficiency as the determinants of the digital divide phenomenon. Especially, the extant research [14–16] on information technology acceptance showed that gender is an important factor affecting user acceptance of TBSSs. According to a study by Ju et al. [17], which analyzed the gender gap among older people in Korea, men reported higher time spent on information and communication technology, information capability, Internet, and mobile utilization than women. As per a study by Choi and Yoo [18], men had more positive technology readiness for tourism mobile apps than women, and women had more negative technology readiness than men. Kim and Oh [19] found that the convenience of using the mobile payment service for men did not affect acceptance intention. However, the convenience of using the mobile payment service for women affects the acceptance intention. This means that the digital gap differs by gender and that the digital gap among women is more severe than that of men. Therefore, in order to increase the intention to use self-order kiosks of restaurant customers, it is most important to identify the impact relationship of gender differences along with technology preparation. Although numerous studies [20,21] indicate that age is an important variable in predicting customer acceptance of new technologies, if both digital immigrants and digital natives are included in the research subjects to identify TRI, the technical readiness will be offset. Therefore, it is necessary to select a specific age group with a similar consumption trend, but TRI studies considering gender and age are not yet sufficient. Accordingly, this study seeks to identify attitudes toward technology acceptance by dividing middle and high-aged groups with very low levels of digital informatization utilization and competence by gender.

This study, therefore, aims to identify the moderating role of gender in the relationship between personal TRI and the intention to continue using self-service kiosks among middle-aged and older consumers at fast-food restaurants. The findings of this research can be used by restaurant managers to decide whether to install self-service kiosks.

2. Theoretical Background

2.1. Technology Readiness Index (TRI)

The TRI estimates people's propensity to embrace and use new technologies for accomplishing goals in their home and work lives [9]. Parasuraman [9] conducted the National Technology Readiness Survey and developed a TRI consisting of 36 questions. Parasuraman and Colby [22] later developed TRI 2.0, which compressed the 36 questions into 16.

The TRI consists of positive (optimism and innovativeness) and negative (discomfort and insecurity) factors. Optimism is the positive belief that new technologies will improve flexibility and efficiency of life and work. Innovativeness is the tendency to use new technology before other people and become a pioneer. Discomfort arises over the consumers' feeling of lack of control and oppression by the technology. Insecurity is the feeling of being insecure with new technology and being skeptical about its viability [9]. The TRI plays the

role of the leading variable [11,23,24] in the expanded model (i.e., technology readiness) and acceptance model in the theory related to acceptance of information technology (i.e., technology acceptance model and the unified theory of acceptance and use of technology). Further, it plays a moderating role in the relationship between the factors determining technology acceptance and consumer attitudes [24,25].

Recently, there have been some studies on TRI in the hospitality industry. In a study involving TBSS users in a Malaysian airport, Ab Halim [26] used all four variables suggested by Parasuraman [9] and found that positive TRI (optimism and innovativeness) positively affects user satisfaction. Lee [21] also used all four variables in a study on hotel guests, finding that optimism, innovativeness, and insecurity affect perceived usefulness. Lee [21] further discovered that optimism, discomfort, and insecurity have significant effects on perceived convenience. Pradhan et al. [27] analyzed tourists' intent to use smart devices and observed that optimism has a significant positive impact on perceived benefits, but not innovativeness. Also, both insecurity and discomfort significantly affect perceived risk. In contrast, adopting only two factors (i.e., positive and negative TRIs,) Seo et al. [8] conducted a research where the respondents were users of tourism applications on smartphones, and found that only positive TRI has a positive effect on perceived usefulness and perceived ease of use. Lee [28] only applied optimism and innovativeness in his research on users of TBSS in a restaurant, noticing that only optimism has an effect on usefulness, ease of use, playfulness, and perceived risk. Moon and Moon [12] evaluated the excellence of the dimensional structure of the TRI by tapping into restaurant customers using TBSS as their research subjects. They found that the fitness indices of the model using all four factors and the one using a two-dimensional TRI with positive and negative variables were relatively high. Further, only optimism and the positive TRI impacted customers' intention to act in both models. In addition, Lee et al. [29], Lin and Chang [11], and Han and Park [30] measured TRI by integrating four variables into one dimension, whereas Sun et al. [31] only used discomfort as the resulting variable affected by cultural values. Thus, scholars have used questions and factor structures in various ways. We used four TRI factors indiscriminately to identify the core factors of TRI that can induce the continuous use of restaurant TBSS by examining the TRI of consumers.

2.2. Continuous Use Intention

It is important for companies to improve service conditions that customers consider useful [32]. In recent studies in the field of information and communication, continuous use has been a core factor in predicting the use of new technologies [23]. Park and Lee [33] defined continuous use intention as the degree of willingness to continue to use order and payment services through kiosks, which is determined by the evaluation of the users of the service.

There have been many studies on the effect of consumers' TRI on continuous use intention in the hospitality industry. In their research on check-in kiosks in US airlines, Lee et al. [29] found that the TRI of consumers affects attitudes toward kiosks, service providers, and continuous use intention. Moon and Moon [12] conducted research on restaurant customers who used TBSS for order and payment and found that only optimism has a positive effect on continuous use, while innovativeness, insecurity, and discomfort did not have significant effects on it. Choi et al. [34] found that optimism has a positive effect on the continuous use intention of tourists with respect to mobile tourism applications, whereas insecurity has a negative effect. Meanwhile, Seo et al. [8] found that neither positive nor negative TRIs had any effect on the continuous use intention for mobile tourism applications.

Thus, research has shown that the effect of TBSS on continuous use intention varies depending on the new technology type and dimensional structure of TRI. To discover the four TRI factors affecting the continuous use intention for fast-food restaurant kiosks, we formulate the following hypotheses.

Hypothesis 1 (H1). *Innovativeness of middle-aged and elderly consumers will have a positive (+) effect on the continuous use intention for fast-food restaurant kiosks.*

Hypothesis 2 (H2). *Optimism of middle-aged and elderly consumers will have a positive (+) effect on the continuous use intention for fast-food restaurant kiosks.*

Hypothesis 3 (H3). *Discomfort of middle-aged and elderly consumers will have a negative (−) effect on the continuous use intention for fast-food restaurant kiosks.*

Hypothesis 4 (H4). *Insecurity of middle-aged and elderly consumers will have a negative (−) effect on the continuous use intention for fast-food restaurant kiosks.*

2.3. Gender

Research in the information and communication industry has shown that the gender of users affects various decision-making processes, such as information search and technology acceptance, thus emphasizing the importance of gender to marketing managers [20,35].

Previous studies that analyzed the difference in the TRI according to gender are as follows. In their analysis of the demographic characteristics of those who embrace hotel radio-frequency identification technology, Ozturk and Hancer [14] found that women are more likely to intend to use radio-frequency identification technology than men. Further, Victorino et al. [36] divided hotel guests into three groups (innovators, paranoids, and laggards) depending on TRI, and found that men tend to innovate more and are more open to the use of new technologies, while women tend to innovate less and are reluctant to use new technologies. In a research on TBSS users in Malaysian airports, Ab Halim [26] found that men are more likely to embrace innovative new technologies like TBSSs and are less insecure than women. The research of Kim and Kim [20] involving restaurant customers also suggested that men are more innovative, and women are more insecure, while neither differs on optimism. Meanwhile, in her research on hotel guests who have never used TBSSs, Lee [21] found that men are more optimistic and innovative than women, and women are more likely to feel discomfort than men. However, there was no gender difference in the ratio of insecurity. Wang and Sparks [37] found that there is no gender difference in TRI in their study on airline and hotel guests.

The results of studies that analyzed the moderating effect of gender in the relationship between the factors influencing the acceptance of new technology and the consumer's acceptance attitude are as follows. Venkatesh et al. [38] reported that the intention to adopt and use a system is more highly affected by effort expectancy for women than for men. Huang et al. [39] found that gender affects the relationship between normative beliefs and behavioral intention such that the effect is stronger for women. Tarhini et al. [40] found that gender moderates the relationship between perceived ease of use, social norms, and behavioral intention, while no moderating effects were found in terms of perceived usefulness and self-efficacy on behavioral intention. Humbani and Wiese [41] found that gender moderates only the relationship between convenience and the adoption of mobile payment services. There are no interaction effects of gender on the other seven factors tested in this study. On closer inspection, it emerged that males put more emphasis on the convenience derived from the use of mobile payments than do their female counterparts. In a study by Shao et al. [42], which analyzed the moderating effect of gender on mobile payment platforms, it was found that the influence of security and customization on trust was greater for women than for men. In addition, the influence of mobility and reputation on trust was found to have a greater effect on men than women. In a study by Chawla and Joshi [43] regarding the acceptance of mobile wallets, the influence of facilitating conditions and security on attitudes was found to be greater in male users than in female users.

As a result of these previous studies, in the foodservice market of South Korea where TBSSs are being introduced, the gender of consumers can serve as a useful means to explain and predict consumer behavior. However, despite growing research efforts to determine the effect of gender on the adoption of new self-service technologies, the results of the

previous studies reviewed were conflicting. Furthermore, to the best knowledge of the authors, there are no empirical studies that report the moderating effects of gender on the TRI that influence the adoption of self-order kiosks in Korea, where self-order kiosk services are rapidly being introduced. Therefore, this study proposes the following hypothesis:

Hypothesis 5 (H5). *Gender plays a moderating role in the relationship between the innovativeness of foodservice consumers and continuous use intention.*

Hypothesis 6 (H6). *Gender plays a moderating role in the relationship between the optimism of foodservice consumers and continuous use intention.*

Hypothesis 7 (H7). *Gender plays a moderating role in the relationship between the discomfort of foodservice consumers and continuous use intention.*

Hypothesis 8 (H8). *Gender plays a moderating role in the relationship between the insecurity of foodservice consumers and continuous use intention.*

3. Materials and Methods

3.1. Measurement Model

This research aims to examine the moderating effect of gender on the relationship between the TRI of kiosk users and their continuous use intention. To achieve this, we assumed that the four dimensions of TRI would have significant effects on the continuous use intention of kiosks. We further assumed that gender would moderate the relationship between the two variables. The constructed research model is shown in Figure 1.

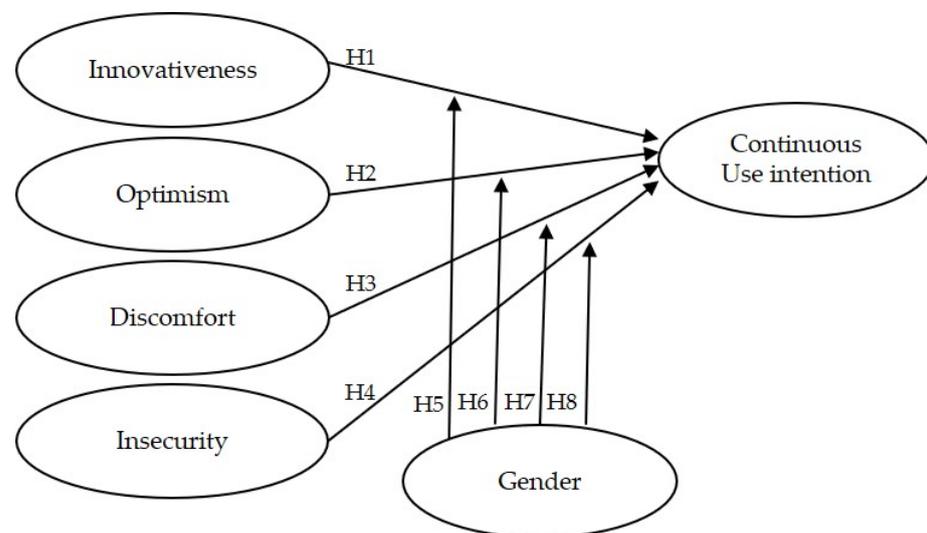


Figure 1. Research model.

3.2. Research Instruments

To measure the TRI, we used 16 questions in total—four each on optimism, innovativeness, discomfort, and insecurity based on TRI 2.0 [22]. To measure continuous use intention, we used three questions based on Cheng et al. [44]. All 19 items in the instrument were measured on a five-point Likert type scale anchored by 1 = strongly disagree and 5 = strongly agree. In addition, the demographic characteristics of respondents were examined using five questions about their gender, age, marital status, educational level, and frequency of using kiosks.

3.3. Data Collection

As discussed in the introduction section, if consumers of all ages are included in the study, the TRI will be offset. Thus, using a non-probabilistic sampling method, we conducted a survey of consumers born before 1980 who had previous experience using kiosk-based ordering and payment systems. The base year for dividing digital immigrants and digital natives according to digital competencies is 1980 in Prensky [45].

Data collection took place for a month from 1st May to 30th May 2020 at six stores in Lotteria, the fast-food brand with the most active kiosks in South Korea [46]. We first explained the purpose of the study to consumers who were leaving the store after eating at a restaurant. We then conducted the survey on site using a self-administered paper questionnaire for those who agreed to participate. To increase participation in the survey, we offered hand sanitizers as compensation to respondents. Among the 350 questionnaires, 320 were used in the analysis. We excluded 21 questionnaires as they were filled out by those born in and after 1980, and nine that had many missing values.

3.4. Data Analysis

We used the SPSS 18.0 program to analyze the data, and frequency analysis to determine the demographic characteristics of the respondents. To test the validity and reliability of measurement items, exploratory factor and reliability analyses were conducted. A correlation analysis was carried out to examine the relatedness of constructive concepts. Finally, we applied hierarchical regression analysis, as suggested by Baron and Kenny [47], to determine the moderating effect of gender. Before conducting the hierarchical regression analysis, we performed a mean centering of independent and moderating variables to solve the problem of multicollinearity.

4. Results

4.1. Participant Characteristics

The results of the frequency analysis of the demographic characteristics of the respondents are shown in Table 1. The numbers of men and women in the sample were 165 (51.6%) and 155 (48.4%), respectively. The number of respondents in their 40 s was the highest with 146 (45.6%), followed by 102 (31.9%) in their 50 s, and 72 (22.5%) in their 60 s and older. With respect to marital status, 243 (75.9%) were married and 46 (14.4%) were single. With regard to the frequency of kiosk use per week, 207 (64.7%) used kiosks one to three times, 96 (30.0%) used them four to six times, and 17 (5.3%) used them seven times or more.

Table 1. Participant characteristics.

Characteristics		Frequency	Percentage (%)
Gender	Female	155	48.4
	Male	165	51.6
Age	40 s	146	45.6
	50 s	102	31.9
	60 s and older	72	22.5
Marital status	Single	46	14.4
	Married	243	75.9
	Other	31	9.7
Educational level	High school	44	13.8
	College degree	107	33.4
	Bachelor's degree	118	36.9
	Master's or doctoral degree	51	15.9
Frequency of using the self-service kiosk per week	1–3 times	207	64.7
	4–6 times	96	30.0
	More than 7 times	17	5.3
Total		320	100.0

4.2. Results of Reliability and Validity Analyses

To measure the TRI and continuous use intention of foodservice consumers, we conducted an exploratory factor analysis. The results are shown in Table 2. The measure of the sampling adequacy of the Kaiser–Meyer–Olkin (KMO) was 0.735, indicating statistical significance. Bartlett’s test of sphericity value was also statistically significant ($\chi^2 = 3059.371$, $p = 0.000$), verifying the suitability of data for factor analysis. The factor analysis extracted five factors with eigenvalues of 1.0 or above. Based on their core concepts, the factors were named, “innovativeness” for factor 1, “discomfort” for factor 2, “optimism” for factor 3, “insecurity” for factor 4, and “continuous use intention” for factor 5. In addition, the Cronbach’s α values were 0.755 or higher for all four factors, confirming the reliability of the internal consistencies of measurement items.

Table 2. Results of the reliability and validity analyses.

Scale Items	Loading	Eigenvalue
Innovativeness (Variance = 15.817%, Cronbach’s $\alpha = 0.832$)		
In general, I am among the first in my circle of friends to adopt new technology when it appears	0.884	3.005
Other people come to me for advice on new technologies	0.835	
I can usually figure out new high-tech products and services without help from others	0.833	
I keep up with the latest technological developments in my areas of interest	0.560	
Discomfort (Variance = 15.118%, Cronbach’s $\alpha = 0.857$)		
When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I am being exploited by someone who knows more than I do	0.910	2.872
Technical support lines are not helpful because they do not explain things in terms I understand	0.844	
Sometimes, I think that technology systems are not designed for usage by ordinary people	0.826	
There is no such thing as a manual for a high-tech product or service that is written in plain language	0.729	
Optimism (Variance = 13.623%, Cronbach’s $\alpha = 0.791$)		
Technology gives me more freedom of mobility	0.884	2.588
Technology makes me more productive in my personal life	0.842	
New technologies contribute to a better quality of life	0.674	
Technology gives people more control over their daily lives	0.600	
Insecurity (Variance = 13.438%, Cronbach’s $\alpha = 0.804$)		
Technology lowers the quality of relationships by reducing personal interaction	0.875	2.553
Too much technology distracts people to a point that is harmful	0.800	
I do not feel confident doing business with a place that can only be reached online	0.756	
People are too dependent on technology to do things for them	0.701	
Continuous use intention (Variance = 10.321%, Cronbach’s $\alpha = 0.755$)		
I intend to continue using self-service kiosks in the future	0.845	1.961
I will always try to use self-service kiosks in my daily life	0.834	
I will keep using self-service kiosks as regularly as I do now	0.559	

Note: KMO = 0.753, Bartlett’s sphericity test = 3059.371, $df = 171$, $p < 0.000$.

4.3. Descriptive Statistics and Correlation Analysis

Before testing the hypotheses, a correlation analysis was conducted for each factor, and the results are shown in Table 3. Continuous use intention was positively (+) correlated with innovativeness ($r = 0.535$), optimism ($r = 0.203$), and gender ($r = 0.312$). It was negatively (–) correlated with discomfort ($r = -0.127$) and had no correlation with insecurity. There was no factor with a correlation coefficient of 0.8, confirming that there was no problem of multicollinearity.

Table 3. Descriptive statistics and correlation analysis between the variables.

Factor	1	2	3	4	5	6
1. Innovativeness	1					
2. Optimism	0.175 **	1				
3. Discomfort	−0.051	0.173 **	1			
4. Insecurity	−0.050	0.284 ***	0.098	1		
5. Gender	0.246 ***	0.226 ***	−0.133 *	0.009	1	
6. Continuous use intention	0.535 ***	0.203 ***	−0.127 *	−0.017	0.312 ***	1
Mean	3.09	3.19	3.20	3.67	1.52	3.35
SD	0.51	0.50	0.48	0.44	0.50	0.47

Note: A female was coded as 1, and a male was coded as 2. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.4. Results of Independent t-Test

To analyze the difference in the TRI based on gender, an independent t-test was conducted, and its results are shown in Table 4. Among the TRI factors, the means of optimism, innovativeness, and discomfort were found to be significantly different based on gender ($p < 0.05$). The means of optimism and innovativeness were higher in men than in women, whereas that of discomfort was higher in women than in men. However, there was no statistically significant difference in insecurity based on gender.

Table 4. Results of independent t-test.

		Mean	SD	t
Innovativeness	Female	3.07	0.51	−4.134 **
	Male	3.30	0.47	
Optimism	Female	2.96	0.57	−4.483 **
	Male	3.21	0.41	
Discomfort	Female	3.27	0.51	2.394 *
	Male	3.14	0.44	
Insecurity	Female	3.67	0.44	−0.166
	Male	3.66	0.44	

Note: * $p < 0.05$, ** $p < 0.001$.

4.5. Results of Hypothesis Testing

The results of the hierarchical regression analysis for the moderating effect of gender on the relationship between TRI and continuous use intention of self-service kiosks are shown in Table 5.

First, the R-squared value of Model 1 of the effect of TRI on continuous use intention was 30.5%, and the regression model was statistically significant ($F = 36.044$, $p < 0.000$). Among the factors of TRI, innovativeness ($\beta = 0.503$, $p < 0.001$) and optimism ($\beta = 0.142$, $p < 0.001$) had positive effects on continuous use intention, whereas discomfort ($\beta = -0.124$, $p < 0.05$) had a negative effect on it. These findings support H1, H2, and H3. However, H4 was rejected because insecurity did not have a significant effect on continuous use intention.

Second, the R-squared value of Model 2, which consisted of the TRI and the moderating variable, gender, was 33.6%, and the regression model was statistically significant ($F = 31.806$, $p < 0.000$). Thus, gender had a positive effect ($\beta = 0.159$, $p < 0.001$) on continuous use intention.

Third, the R-squared value of Model 3, which includes the TRI of foodservice consumers and interaction variable using gender, was 36.8%, 3.1% more than that of Model 2. Among the TRI factors, only the interaction variable of innovativeness and gender plays the role of a moderating variable ($\beta = 0.177$, $p < 0.001$). These findings support H5; however, H6, H7, and H8 were rejected.

Table 5. Results of the hierarchical regression analysis.

	Model 1			Model 2			Model 3		
	B	β	t	B	β	t	B	B	t
(Constant)	3.352		154.193 ***	3.352		156.501 ***	3.325		146.608 ***
Innovativeness(A)	0.46	0.503	10.517 ***	0.431	0.472	9.808 ***	0.494	0.54	10.639 ***
Optimism(B)	0.132	0.142	2.822 **	0.098	0.106	2.081 *	0.12	0.129	2.553 *
Discomfort(C)	−0.12	−0.124	−2.604 *	−0.095	−0.099	−2.073 *	−0.129	−0.133	−2.751 **
Insecurity(D)	−0.021	−0.02	−0.407	−0.016	−0.015	−0.315	−0.003	−0.003	−0.054
Gender(E)				0.148	0.159	3.241 ***	0.127	0.136	2.792 **
A × E							0.33	0.177	3.588 ***
B × E							0.069	0.036	0.737
C × E							−0.055	−0.028	−0.594
D × E							0.119	0.055	1.163
R ² (adj.R ²)	0.314 (0.305)			0.336 (0.326)			0.368 (0.349)		
ΔR ²	0.314			0.022			0.031		
F	36.044 ***			31.806 ***			20.027 ***		
F variation	36.044 ***			10.503 ***			3.856 **		

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, Durbin–Watson = 1.713.

Figure 2 illustrates how innovativeness and gender, which show an interaction effect, affect continuous use intention. In order to analyze the moderating effect through hierarchical regression analysis, a graph is generally drawn by substituting a high moderating variable value (Z mean + 1 standard deviation), a middle moderating variable value (Z mean), and a low moderating variable value (Z mean—standard deviation) into the regression equation to analyze the moderating effect [48]. In this study, the standard deviation of gender was ±0.47. The regression equation is shown as Equation (1). The graph shows that as innovativeness increases, men’s intention to continue using kiosks increases more than that of women.

$$Y = 0.494X + 0.127Z + 0.33XZ + 3.325 \tag{1}$$

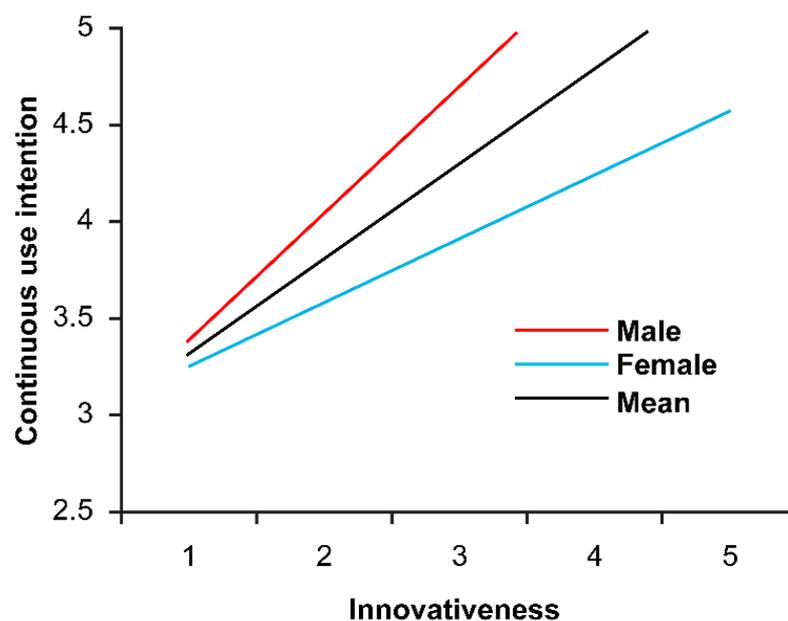


Figure 2. Result of a simple slope test using regression equation of innovativeness and gender.

5. Discussion

This study examined the moderating role of gender in the relationship between TRI and the continuous use intention of kiosks in fast-food restaurant consumers. Consumers who used kiosks were surveyed in six fast-food restaurants in Seoul and 320 questionnaires were deployed.

There were three main findings of the analysis. First, higher innovativeness and optimism factors lead to higher continuous use intention of kiosks in fast-food restaurants. In contrast, a higher discomfort factor leads to lower continuous use intention of kiosks in fast-food restaurants. These findings are partially consistent with those of existing studies [12,29,33], which show that positive TRI has a positive effect on the continuous use intention of TBSSs and negative TRI has a negative effect on the continuous use intention of TBSS.

Second, among the TRI factors, insecurity was found to have no significant effect on continuous use intention. This finding is contradictory to that of Lee's [21], who suggested that the insecurity of users of TBSSs in hotels has the greatest effect on the usefulness of TBSSs. Such contradictory findings may be caused by the fact that, in fast-food restaurant kiosks, the user pays after selecting a menu item. Also, unlike TBSSs in hotels, the risk of personal information exposure in fast-food restaurant kiosks is relatively low.

Third, men were found to have a higher intent to continue using kiosks than women. Moreover, among TRI factors, the effect of innovativeness on the continuous use intention of kiosks was different between men and women. That is, high innovativeness causes men to intend to continue using kiosks more than women. These findings are consistent with those of previous studies [20,26,36], which indicated that men embrace new technologies more readily than women.

Our findings have numerous academic and practical implications. The existing TRI literature has mainly focused on interactions among variables without considering the role of gender. This study analyzed the moderating role of gender among middle-aged and older consumers of fast-food restaurants. Further, the findings can be useful for fast-food restaurant managers in developing and implementing marketing strategies. Our results have three practical applications. First, the more positively a user responds to new technologies, the higher is his or her continuous use intention. Moreover, innovative consumers who want to use new technologies before others and be technological leaders will continue to use such kiosks. Thus, it is important to raise the optimism and innovativeness of users. Considering that innovativeness is the most effective factor for continuous use intention among the TRI factors, it is advisable to develop various types of kiosks by applying information and communications technologies, such as near field communication payment or voice recognition functions, to raise the hedonic motivation of consumers. Second, it is necessary to highlight the comfort of ordering and paying through kiosks for middle-aged and older consumers who scored high on negative TRI to improve their intent to continue using them. For middle-aged and older women who feel uncomfortable being served by machines, restaurant managers must assign an employee to assist them and must construct more user-friendly interfaces for readability, design, and order processing to lessen their discomfort and increase the possibility of continuous use. Third, the study found that even female consumers who want to become technologically pioneering by using new technologies before others do not have a greater increase in their intention to order and pay for menus through self-order kiosks. Therefore, in developing kiosks, fast-food restaurant managers should be aware that men and women can perceive the same TBSS differently to improve the interaction between customers and technology.

This study has its limitations. First, the research sample is not representative since we only chose customers who had used kiosks installed in restaurants, which is the most common type of TBSS. Thus, our findings cannot be generalized to include users of other types of TBSSs such as mobile applications, blockchains, and artificial intelligence. Accordingly, future studies should consider other TBSS types. Second, the continuous use intention of TBSS can be affected by various situational conditions such as demographic

characteristics, psychological factors, service use experiences, and time. However, this research does not reflect these variables. Thus, it is necessary to increase the scale of the research by including more variables that can affect the user intent toward TBSSs.

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References

- Dabholkar, P.A. Incorporating Choice into an Attitudinal Framework: Analyzing Models of Mental Comparison Processes. *J. Consum. Res.* **1994**, *21*, 100–118. [[CrossRef](#)]
- Jeon, H.A.; Kim, K.A.; Kim, S.H. The Effects of Customer's Relational Benefits on Continuous Usage Intention of Technology-Based Self-Service: Focusing on Types of Technology-Based Self-Service. *J. Mark. Manag. Res.* **2018**, *23*, 27–49.
- Chagang, H.J. Impacts of Universal Design Components on Perceived Service Quality and Service Value in Technology-Based Self-Service Environments. *Arch. Des. Res.* **2010**, *23*, 115–125.
- Korea Agro-Fisheries & Food Trade Corporation. *2019 Food Service Trend Survey*; Korea Agro-Fisheries & Food Trade Corporation: Naju, Korea, 2020.
- Liljander, V.; Gillberg, F.; Gummerus, J.; Van Riel, A. Technology Readiness and the Evaluation and Adoption of Self-Service Technologies. *J. Retail. Consum. Serv.* **2006**, *13*, 177–191. [[CrossRef](#)]
- Jang, S.J. Examining Factors Affecting the Digital Divide of the Elderly. *Media Perform. Arts* **2016**, *11*, 146–170.
- Kim, S.W. Past and Future of the Digital Divide: A Bibliometric Analysis and Review. *Informatiz. Policy* **2011**, *18*, 103–137.
- Seo, J.Y.; Kim, S.I.; Jeong, C. Effects of Technology Readiness on Usage Intention of Smart-Phone Tourism Applications: An Application of the Technology Readiness and Acceptance Model. *J. Tour. Sci.* **2018**, *42*, 109–127.
- Parasuraman, A. Technology Readiness Index (TRI) a Multiple-Item Scale to Measure Readiness to Embrace New Technologies. *J. Serv. Res.* **2000**, *2*, 307–320. [[CrossRef](#)]
- Lin, C.H.; Shih, H.Y.; Sher, P.J. Integrating Technology Readiness into Technology Acceptance: The TRAM Model. *Psychol. Mark.* **2007**, *24*, 641–657. [[CrossRef](#)]
- Lin, J.S.C.; Chang, H.C. The Role of Technology Readiness in Self-service Technology Acceptance. *Manag. Serv. Qual. Int. J.* **2011**, *21*, 424–444. [[CrossRef](#)]
- Moon, H.Y.; Moon, H.S. Effects of Technology Readiness on Behavioral Intention toward Technology-Based Self-Service: Comparison of Superiority of Construct and Measurement Model for Technology Readiness. *J. Hosp. Tour. Stud.* **2019**, *21*, 275–289. [[CrossRef](#)]
- Livingstone, S.; Van Couvering, E.; Thumim, N. *Adult Media Literacy: A Review of the Research Literature*; Office of Communications (Ofcom): London, UK, 2005.
- Ozturk, A.B.; Hancer, M. The Effects of Demographics and Past Experience on RFID Technology Acceptance in the Hospitality Industry. *Int. J. Hosp. Tour. Adm.* **2015**, *16*, 275–289. [[CrossRef](#)]
- Venkatesh, V.; Thong, J.Y.; Xu, X. Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Q.* **2012**, 157–178. [[CrossRef](#)]
- Zhang, L.; Nyheim, P.; Mattila, A.S. The Effect of Power and Gender on Technology Acceptance. *J. Hosp. Tour. Technol.* **2014**, *5*, 299–314. [[CrossRef](#)]
- Ju, K.H.; Kim, D.S.; Kim, J.H. Analysis of Factors Influencing Digital Divide on Elderly and Difference of Gender. *Soc. Welf. Policy* **2018**, *45*, 95–121.
- Choi, J.E.; Yoo, D.H. The Effects of Consumers' Gender and Perceived Risk on Their Mobile App Use Intention in Tourism Industry: The Mediating Role of Technology Readiness. *Korean Corp. Manag. Rev.* **2020**, *27*, 23–43.

19. Kim, H.J.; Oh, S.G. Effects of Gender Difference and Perceived Risk on Acceptance Intention of Mobile Easy Payment Service. *J. Manag. Econ.* **2019**, *41*, 145–165.
20. Kim, K.M.; Kim, N.J. Analysis of Food Consumers of Usage Attitude and Usage Intention towards Technology-Based Self-Service (TBSS): Focused on TRAM (Integrated Technology Readiness and Acceptance Model). *J. Tour. Leis. Res.* **2019**, *31*, 237–257. [[CrossRef](#)]
21. Lee, S.H. The Effects of Customers' Technology Readiness on Intention to Use of Technology Based Self Service (TBSS) in Hotel Industry. *J. Hotel Resort* **2020**, *19*, 23–43.
22. Parasuraman, A.; Colby, C.L. An Updated and Streamlined Technology Readiness Index: TRI 2.0. *J. Serv. Res.* **2015**, *18*, 59–74. [[CrossRef](#)]
23. An, U.S. A Study on Factors of Determining Continuous Use of SNS: Based on Technology Readiness Acceptance Model. *J. Korea Serv. Manag. Soc.* **2016**, *17*, 257–280.
24. Meng, F.; Park, K.S.; Oh, S.W. The Moderating Effects of Technology Readiness, User Traits and Situational Factors on Usage Attitude and Intention to Technology-Based Self-Service. *J. Korea Serv. Manag. Soc.* **2017**, *18*, 69–104.
25. Tsourela, M.; Roumeliotis, M. The Moderating Role of Technology Readiness, Gender, and Sex in Consumer Acceptance and Actual Use of Technology-Based Services. *J. High Technol. Manag. Res.* **2015**, *26*, 124–136. [[CrossRef](#)]
26. Ab Halim, N. Technology Readiness and Users Satisfaction towards Self-Service Technology at Malaysian Airport. *Inf. Manag. Bus. Rev.* **2012**, *4*, 453–460. [[CrossRef](#)]
27. Pradhan, M.K.; Oh, J.J.; Lee, H.S. Understanding Travelers' Behavior for Sustainable Smart Tourism: A Technology Readiness Perspective. *Sustainability* **2018**, *10*, 4259. [[CrossRef](#)]
28. Lee, M.H. The Acceptance of Self-Service Technology and Word-of-Mouth Intend According to Individual Traits of Technology Readiness in the Food Franchise Industry. *J. Foodserv. Manag.* **2019**, *22*, 7–33.
29. Lee, W.; Castellanos, C.; Choi, H.S.C. The Effect of Technology Readiness on Customers' Attitudes toward Self-Service Technology and Its Adoption; the Empirical Study of US Airline Self-Service Check-in Kiosks. *J. Travel Tour. Mark.* **2012**, *29*, 731–743. [[CrossRef](#)]
30. Han, S.L.; Park, S.M. Effects of Technology Readiness on the Attitude and Usage Intention of Self Service Technology. *Entrue J. Inf. Technol.* **2009**, *8*, 51–63.
31. Sun, S.; Lee, P.; Law, R. Impact of Cultural Values on Technology Acceptance and Technology Readiness. *Int. J. Hosp. Manag.* **2019**, *77*, 89–96. [[CrossRef](#)]
32. Kim, B.G.; Kim, K.W.; Seo, H.I. Effects of Mobile App Service Characteristics on User Satisfaction and Continuance Usage Intention. *J. Inf. Technol. Appl.* **2019**, *26*, 99–120.
33. Park, J.W.; Lee, H.R. The Effect of Fast Food Restaurant Customers' Kiosk Use on Acceptance Intention and Continuous Use Intention: Applying UTAUT2 Model and Moderating Effect of Familiarity. *J. Tour. Sci.* **2020**, *44*, 207–228.
34. Choi, J.E.; Yoo, D.H.; Choi, S.A. The Effect of Technology Readiness Gap by Tourists' Age and Risk Perception on Their Mobile Tourism App Use Intention. *Tour. Leis. Study* **2014**, *26*, 387–405.
35. Ahuja, M.K.; Thatcher, J.B. Moving beyond Intentions and toward the Theory of Trying: Effects of Work Environment and Gender on Post-Adoption Information Technology Use. *MIS Q.* **2005**, 427–459. [[CrossRef](#)]
36. Victorino, L.; Karniouchina, E.; Verma, R. Exploring the Use of the Abbreviated Technology Readiness Index for Hotel Customer Segmentation. *Cornell Hosp. Q.* **2009**, *50*, 342–359. [[CrossRef](#)]
37. Wang, Y.; Sparks, B. Technology-Enabled Services: Importance and Role of Technology Readiness. *Tour. Anal.* **2014**, *19*, 19–33. [[CrossRef](#)]
38. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User Acceptance of Information Technology: Toward a Unified View. *MIS Q.* **2003**, *27*, 425–478. [[CrossRef](#)]
39. Huang, W.-H.D.; Hood, D.W.; Yoo, S.J. Gender Divide and Acceptance of Collaborative Web 2.0 Applications for Learning in Higher Education. *Internet High. Educ.* **2013**, *16*, 57–65. [[CrossRef](#)]
40. Tarhini, A.; Hone, K.; Liu, X. Measuring the Moderating Effect of Gender and Age on E-Learning Acceptance in England: A Structural Equation Modeling Approach for an Extended Technology Acceptance Model. *J. Educ. Comput. Res.* **2014**, *51*, 163–184. [[CrossRef](#)]
41. Humbani, M.; Wiese, M. A Cashless Society for All: Determining Consumers' Readiness to Adopt Mobile Payment Services. *J. Afr. Bus.* **2018**, *19*, 409–429. [[CrossRef](#)]
42. Shao, Z.; Zhang, L.; Li, X.; Guo, Y. Antecedents of Trust and Continuance Intention in Mobile Payment Platforms: The Moderating Effect of Gender. *Electron. Commer. Res. Appl.* **2019**, *33*, 100823. [[CrossRef](#)]
43. Chawla, D.; Joshi, H. The Moderating Role of Gender and Age in the Adoption of Mobile Wallet. *Foresight* **2020**, *4*, 483–504. [[CrossRef](#)]
44. Cheng, Y.; Sharma, S.; Sharma, P.; Kulathunga, K. Role of Personalization in Continuous Use Intention of Mobile News Apps in India: Extending the UTAUT2 Model. *Information* **2020**, *11*, 33. [[CrossRef](#)]
45. Prensky, M. Digital Natives, Digital Immigrants. *Horiz.* **2001**, *9*, 1–6.
46. Cho, W.H.; Jeon, H.M. Consumer's Acceptance Intention on Introduction of Technology-Based Self Service (TBSS) of Fast Food Restaurant: Focused on Value-Based Acceptance Model. *J. Foodserv. Manag.* **2020**, *23*, 105–129.

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47. Baron, R.M.; Kenny, D.A. The Moderator–Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations. *J. Pers. Soc. Psychol.* **1986**, *51*, 1173. [[CrossRef](#)] [[PubMed](#)]
 48. Hong, S.H.; Jung, S. Testing the Interaction Effects in Regression and Structural Equation Models: Theories and Procedures. *Korean J. Hum. Dev.* **2014**, *21*, 1–24. [[CrossRef](#)]