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How Do Self-Service Kiosks Improve COVID-19 Pandemic Resilience in the Restaurant Industry?

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Abstract: As many customers stopped dining out during COVID-19, most restaurants suffered financially. Even after the pandemic, some customers remain wary of being in a crowded place and show resistance to eating out. Restaurants faced with customer resistance and a labor shortage started to adopt electronic devices to minimize human contact and were recognized as having safety protocols in place. Kiosks have gained popularity in the restaurant industry as they can help reduce interpersonal contact, save labor costs, streamline the ordering process, and increase customer satisfaction and loyalty. This study finds that self-service technologies (e.g., kiosks) can be an effective tool for restaurants to utilize in dealing with COVID-wary customers and to remain resilient. This study not only examines various kiosk attributes and their effect on the customers' experience but also links them to potential revenue growth. By examining a comprehensive set of kiosk attributes, the objective of this study is to understand the role of kiosk attributes in creating a memorable experience for customers based on the concept of the experience economy. The data were collected from 408 restaurant patrons in South Korea who had used self-service technologies. Three analyses were performed using partial least squares structural equation modeling (PLS-SEM), multigroup analysis (MGA), and importance–performance map analysis (IPMA) with SmartPLS 4. The findings are as follows: for male customers, assurance, customization, enjoyment, design, and functionality are considered important aspects of their experience. For female customers, design, enjoyment, and security are important factors in their experience. The finding suggests that males and females consider different attributes in evaluating the technology experience. Additionally, this study finds that a memorable experience with technology affects customers' intention to revisit the restaurant, playing a mediating role between technology attributes and revisit intention. Lastly, this study finds distinct differences between males and females in their assessment of customization and design. The gender-based differences suggest that men and women assess kiosk technologies differently. Future research may be needed to further investigate the underlying causes of the differences.

Keywords: kiosk attributes; self-service technologies; memorable experience; revisit intention

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1. Introduction

A large number of customers stopped dining out during the COVID-19 pandemic due to government regulations, fear of contracting and spreading the disease, and poor customer service at the restaurants [1]. As a result, most restaurants suffered financially. Even after the pandemic, some customers remain wary of being in a crowded place and show resistance to eating out. Restaurants faced with customer resistance and a labor shortage started to adopt electronic devices to minimize human contact and be recognized as restaurants with safety protocols in place [2–4]. Kiosks have gained popularity in the restaurant industry as they can help reduce interpersonal contact, save labor costs,

streamline the ordering process [5,6], and increase customer satisfaction [7] and loyalty [8]. In addition, kiosks can be helpful for collecting information on customers' purchase patterns and behaviors [9] and formulating data-based business strategies [10]. This study finds that self-service technologies (e.g., kiosks) can be an effective tool for restaurants to utilize in dealing with COVID-wary customers and to remain resilient. According to the Korea International Trade Association (KITA), kiosks' global market size is expected to grow from $17.63 billion (about 21 trillion won) in 2020 to $33.99 billion (about 40 trillion won) in 2027. According to the National Statistical Office, about 4.5 percent of Korean restaurants will introduce or use kiosks in 2021, up about five times from 0.9 percent in 2018. Franchised retailers have adopted kiosks more quickly. The adoption rate in the franchised restaurant industry had increased to 10% in 2021 from less than 4% in 2018.

While self-service technology (SST) can help restaurants improve business performance by saving labor costs, delivering services efficiently, and increasing customer satisfaction and loyalty [11,12], some caution that low-touch devices such as kiosks may reduce the quality of the service experience [13]. A few service companies (e.g., hotels) recently removed self-service kiosks completely from their properties as their customers were found to prefer interacting with employees to using SST. Those companies realized that many of their customers experienced technology anxieties and frustration dealing with self-service technologies. This is a huge challenge for service companies that want to optimize business performance using SST as a new operational mode and try to deliver a high-quality service. One of the key questions is identifying which technology attributes are helpful for creating a positive experience for customers rather than causing frustration or anxiety. This study is to examine different attributes (functionality, security, assurance, enjoyment, design, customization, and convenience) of kiosks and their impact on the customers' experience and intention to revisit the restaurant. Prior research [14] points out that certain attributes (e.g., the security of kiosks) are related to creating a worry-free environment and leading to a memorable experience. A great number of studies have been conducted to advance the understanding of customers' adoption of new technologies and identify the factors that influence technology adoption [15–17]. For example, many previous studies based on the models of TAM [18,19] and UTAUT [20,21] studied the factors that influenced customers' acceptance of new technologies. Most of these studies focused on technology adoption, often overlooking the relationship between technology attributes and customers' experiences or subsequent behaviors such as repurchasing. The objective of this study is to examine the role of kiosk attributes in creating a memorable experience for customers based on the concept of the experience economy. In addition, this study examines gender as a potential moderator in the relationship between technology attributes and customers' memorable experiences. Prior studies [22–24] suggest that males and females weigh technology attributes differently in their assessments. In sum, the study's research questions are as follows:

(a) How do seven key technology attributes influence customers' experiences?
(b) What is the relationship between customers' technology experiences and intention to revisit?
(c) How does gender influence the relationship between technology attributes and customers' experiences?

The study's contributions are discussed as follows: First, it is unique in that it examines various kiosk attributes and their effect on the customers' experience and links them to potential revenue growth by examining customers' intentions to revisit. Most prior studies [25–27] limited their investigation to customers' intention to adopt technology, satisfaction, and emotional responses. By including revisit intention, this study captures the impact of kiosks on potential revenue growth. Previous studies (e.g., [28]) unambiguously support a strong correlation between customers' revisit intention and the company's revenue growth. Another contribution of the study is related to its focus on a comprehensive set of technical attributes. While some studies [16] integrated subjective factors (e.g., personal variables) in their studies on SST, they found that technology-related factors were more important than subjective factors in assessing SST. By focusing on several

technical attributes, this study will be able to pinpoint the important technical attributes. The finding will have important managerial implications. Lastly, this study contributes by exploring the potential moderating role of gender in the relationship between technology attributes and customers' technology use experiences. Previous studies [27,29] that examined gender as a potential moderating variable reported inconsistent findings, ranging from significant effects to no effect at all. This study will add some empirical evidence to the literature by revealing the role of gender in technology adoption. The gender-related finding will offer some important implications for targeting strategies as well as service customization strategies.

The structure of this paper is as follows: First, we provide an overview of the literature and discuss relevant theories. Hypotheses are offered to address the study's objectives. Subsequently, the methodology, including the sampling method and measures, and findings are presented.

2. Literature Review and Hypotheses

2.1. Proliferation of Self-Service Technologies

A kiosk is an electronic display device that allows customers to find information, place an order, and make a payment using a touch screen [30]. It is one form of self-service technology (SST) [31], which includes automated teller machines (ATM), interactive tabletop displays, and self-checkout at hotels and supermarkets. Self-service technology has been widely used at airports, bus terminals, gas stations, hotels, retailers, and food service establishments (e.g., cafes). Kiosks have become popular among food service operators during the COVID pandemic as people have become cautious about making human contact [32,33]. The number of customers a service employee can serve during peak hours is limited, which tends to result in long waiting times [34] and customer dissatisfaction [34–37]. SST can play an important role in reducing such negative experiences and improving overall service experiences [38–40]. We believe SST can help restaurants and other hospitality establishments remain resilient when faced with challenging situations where customers feel uncomfortable being in a crowded public place. During COVID-19, restaurants quickly adopted or expanded kiosks to quell the anxieties of the COVID-wary customers and showed resilience by overcoming the labor shortage and continuing to serve the customers. Despite a great volume of studies conducted on SST in some industries (e.g., hotels and retailers), insufficient emphasis has been placed on restaurant settings to understand the important attributes of kiosks. Customers' positive experience with technology is shown to affect the overall evaluation of the service company [41]. A memorable experience with the technology will lead to an overall positive company evaluation.

2.2. Memorable Experience

Memory is the process of encoding, storing, and retrieving information [42]. Memory allows customers to access the acquired information when needed [43]. Customers generally store positive feelings in memory through pleasant and meaningful experiences [44,45] and reconstruct the memory through repetitive actions [46]. Creating a positive, memorable experience has become the focus of some service companies. Based on the concept of the experience economy, the term first used by Pine and Gilmore [47], service companies are not only to deliver promised services but also to create a memorable experience for their customers. Creating a memorable experience is important because a positive, memorable experience can lead to customers' positive attitudes toward the product or service, satisfaction, and intentions to repurchase [48,49]. This study considers memorable experiences as a customer's overall evaluation of the technology use experience [50].

An examination of previous studies offers some guidance by revealing specific attributes associated with an experience or a service that can help create a memory. For example, Şahin and Güzel [51] found in the tourism industry that certain attributes associated with the destination helped create memories for visitors. Warlop, Ratneshwar, and Van Osselaer [52] showed that distinctive brand cues or attributes affected memory related

to product consumption. Jeong and Shin [14] found that self-service technologies helped tourists access and interact with the relevant information source, leading to a memorable experience. Based on previous studies and the concept of the experience economy, this study views kiosk-related technology attributes as important variables that affect customers' memorable experiences [8,53].

2.3. Attributes of Kiosk Technology

The Technology Acceptance Model (TAM) was used predominantly in earlier studies to explain customers' technology adoption behavior. The model considers two major elements (ease of use and usefulness) that play an important role in technology adoption. Although the model [54] is helpful for understanding how and why customers adopt new technology, some scholars viewed it as too simple and made efforts to embrace other variables. The Unified Theory of Acceptance and Use of Technology (UTAUT) [55] was one of the theories developed in such efforts to offer a more holistic approach. The theory integrates several theories, including TAM, and considers four constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is the degree to which a customer believes that using technology will help attain gains in job performance. This is similar to the concept of usefulness in TAM. If the technology is perceived as helpful and useful for job performance, it is more likely to be adopted. Studies found performance expectancy to have the strongest effect on technology use intentions in many different settings [56,57]. For example, Tarhini, Hone, and Liu [22] showed that usefulness significantly impacted intentions to adopt new technology. Effort expectancy is the degree to which a customer perceives the ease of technology use. This construct is similar to the ease of use in TAM. Technology is more likely to be adopted when people perceive it as easy to use [58]. Social influence is a customer's perception that others important to him/her believe that he/she should use the technology [55]. Facilitating conditions are related to a customer's perception regarding the organization's support and technical infrastructure. As discussed before, the construct that has the most influence on adoption is performance expectancy. For example, Jeon, Sung, and Kim [21], who based their study on UTAUT, showed that both performance expectancy (usefulness) and effort expectancy (ease of use) had the greatest influence on behavioral intention to use. This finding suggests that technology-related attributes remain more important than social influence or structural technology support. Based on prior research, this study will focus on technology attributes that are related to kiosks: functionality, security, assurance, enjoyment, design, convenience, and customization. These seven attributes were selected based on the study of Vakulenko, Hellström, and Oghazi [59], who conducted a comprehensive literature review on self-service technologies and identified technology-related variables that are shown to influence customers' experiences.

2.4. Revisit Intention

Revisit intention refers to the inclination or probability of a customer returning to the business [60]. It serves as an indicator of the customer's interest in returning to the business. Businesses consider customers' revisit intention crucial, as it is related to customers' overall positive evaluation of the business (e.g., customer satisfaction) and revenues [61–63]. Prior studies strongly support the correlation between customers' overall experience, repurchase or revisit intention, and revenues [64–67]. This study examines customers' revisit intention as a dependent variable explained by the overall experience of the kiosk.

2.5. The Impact of Technology-Related Attributes on Memorable Experiences

Based on prior research, this study examines seven attributes associated with kiosk technology and their impact on customers' experiences with the technology. Functionality is concerned with the quality of being suited to serve the intended purpose. This element is related to the usefulness of the TAM and the performance expectancy of the UTAUT. As

many studies revealed [68–70], a technology that is considered useful and functional is more easily adopted and used by customers than one that is not.

Many studies [22,71,72] support the idea that usefulness (functionality) is the most significant determinant of users' technology adoption. Security is concerned with a customer's perception that technology allows for secure transactions and maintains information privacy. Prior studies [14,73] show that customers consider security an important factor when adopting new technology, and alleviating or eliminating technology anxiety is essential to expediting technology adoption.

According to Huang, Goo, Nam, and Yoo [74], the significance of potential data breaches and security and privacy concerns is instrumental in driving the adoption of SST in smart tourism settings. Assurance is related to the reliability of the technology and the ability to deliver the promised results. Customers are likely to be dissatisfied when the technology fails to perform as promised or solve the problem [75]. Assurance is related to the concept of performance expectancy in the UTAUT as it addresses the capability to perform. Park, Lehot, and Lehot [76] suggest that assurance should be considered an important SST attribute. Similarly, Pai, Wu, Lee, and Kang [77] show that the assurance attribute is one of the important factors for the WeChat food ordering system.

Enjoyment is the state of taking pleasure in using technology. This variable accounts for an emotional aspect of using technology. Studies [78,79] show that fun affects an attitude toward using and adopting new technology. Vakulenko, Oghazi, and Hellström [80] argue that enjoyment explains the value of emotional experiences. In addition, Lee, Fairhurst, and Cho [23] suggest that enjoyment is one of the service quality dimensions for self-service kiosks.

Design is also expected to influence customers' technology use experiences. Based on previous studies (e.g., [81,82]), a kiosk that has a nice layout and user interface is evaluated more positively than one that does not. Lee, Fairhurst, and Cho [23] suggest that the design and interface features of self-service kiosks have an influence on the actual usage of SST.

Convenience concerns ease of use. Prior research based on the TAM shows that a technology that is easy to use is adopted more quickly than one that is not [83]. For example, Hamid [84] suggests that kiosks that are easy to use help customers quickly find information about menus and adopt the technology. Moon, Lho, and Han [8] show that kiosk usability convenience positively affects kiosk performance evaluation and leads to loyal airline customers in the post-pandemic world.

Customization is about whether a technology can be modified to suit an individual customer's needs or preferences. The literature on service management finds that personalization is essential for increasing customer satisfaction and user experience and maximizing revenue [8,76,85]. In summary, this study finds that all seven technology-related attributes will have a positive impact on the customers' experience with kiosk technology. The following hypothesis is offered:

H1: *Seven attributes of kiosks have a positive effect on customers' memorable experiences.*

H1-1: *Functionality has a positive effect on the customers' memorable experience.*

H1-2: *Security has a positive effect on the customers' memorable experience.*

H1-3: *Assurance has a positive effect on the customers' memorable experience.*

H1-4: *Enjoyment has a positive effect on the customers' memorable experience.*

H1-5: *Design has a positive effect on the customers' memorable experience.*

H1-6: *Convenience has a positive effect on customers' memorable experiences.*

H1-7: *Customization has a positive effect on the customers' memorable experience.*

2.6. The Impact of Memorable Experience on Revisit Intention

Memorable experiences are formed through emotional experiences, and positive emotional experiences are found to be more memorable than negative or neutral experiences [86]. In their qualitative study, Tung and Ritchie [86] identified some positive emotions associated with an experience (e.g., happiness and excitement) as a critical component of a memorable experience. They found that negative experiences (e.g., frustration), unlike positive, memorable experiences, were rarely recalled. In other words, customers are more likely to recall positive memories than negative ones. Customers who have formed memories through positive experiences are more likely to engage in positive post-consumption behaviors, such as intentions to revisit and recommend [87,88]. Previous studies in various fields document a correlation between positive memories and the intention to revisit them [86,89–91]. For example, Barnes, Mattsson, and Sørensen [89] show that memories of tourism experiences positively affect revisit intention [90]. Similarly, Kim, Ritchie, and Tung [91] find that memories of travel experiences, along with interesting activities and hedonic/cultural factors, positively affect the behavioral intention to revisit. Hung, Lee, and Huang [62] show that memories play a mediating role between the tourism experience and revisit intention. In food services, Sthapit, Björk, and Coudounaris [91] find that memories of new and delicious foods positively affect revisit intention. Um, Kim, and Chung [92], who studied the hotel industry, showed that customers' intention to revisit was higher or lower when they had a successful or failed experience with SST. Manthiou, Lee, Tang, and Chiang [93] studied festivals and found that vivid memories of the festival positively influenced future attendance and loyalty. Based on these previous studies, we propose that a memorable experience of using the kiosk technology will have a positive impact on the customers' revisit intention.

H2: *Positive, memorable experience will have a positive effect on the customers' revisit intention.*

2.7. Gender as a Moderator

Gender is an important variable for market segmentation and is useful for explaining the differences between men and women [94]. Gender accounts for the differences in technology adoption and use. Lee, Fairhurst, and Cho [23] suggest that men feel more comfortable adopting and using self-service kiosks than women. Tarhini, Hone, and Liu [22] found that the relationship between ease of use and behavioral intention to adopt new technology was stronger for women than men in the education field, indicating a significant moderating role of gender. They find that women tend to focus more on ease of use than men when considering adopting new technology. Men weigh other components more heavily than women. For example, Shao, Zhang, Li, and Guo [24] found that the impacts of security and customization on trust in mobile payment platforms are stronger for men than women. Furthermore, Lee, Fairhurst, and Cho [23] show that the impact of perceived service quality on the utilization of self-service kiosks was more pronounced among females than males. However, the difference was not statistically significant. Based on these previous studies, we propose that the influence of the kiosk attributes on the customers' technology use experience will differ based on gender.

H3: *Gender will moderate the relationship between the attributes of the self-service kiosks and memorable experiences.*

Based on the hypotheses, the proposed model is shown in Figure 1.

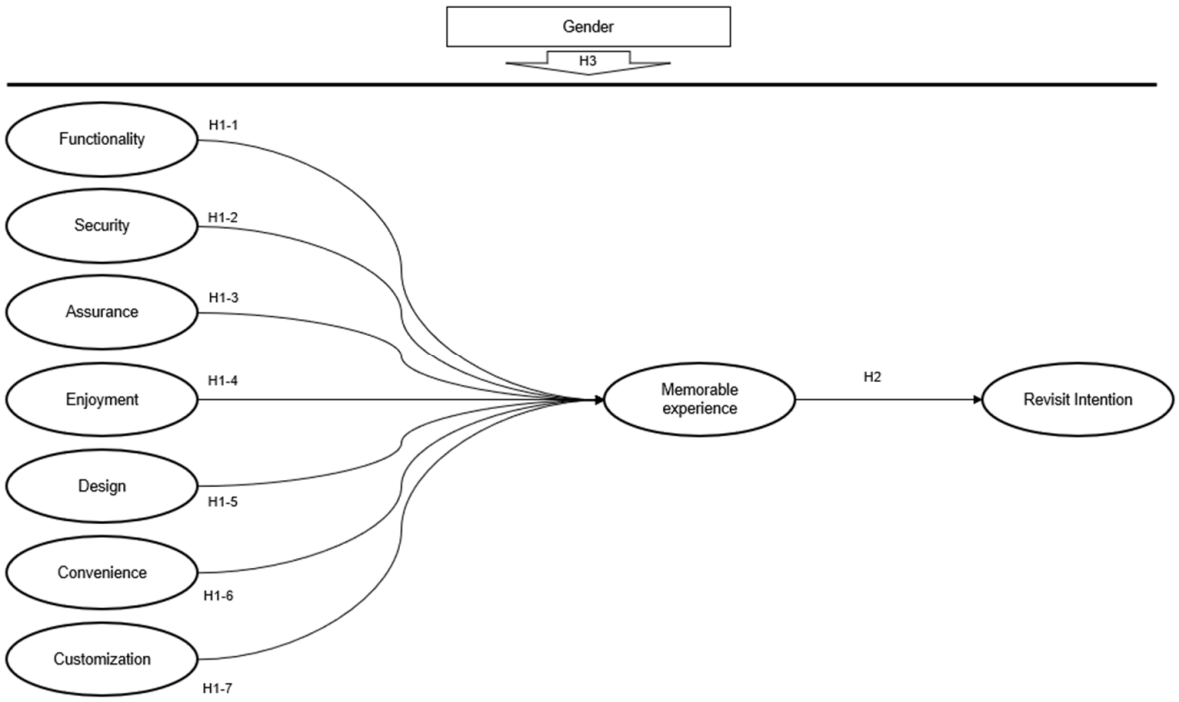

Figure 1. Proposed model.

3. Methodology

3.1. Measures

All items were measured with multiple items adopted from previous studies. The measures were anchored by 1 (strongly disagree) and 7 (strongly agree). Seven attributes of kiosks were measured with multiple items: functionality (five items), enjoyment (four items), security (four items), design (five items), assurance (five items), convenience (five items), and customization (five items). These measures were adopted from Lin and Hsieh's [95] study. Three items were used to measure memorable experiences, which were adopted from Oh, Fiore, and Jeoung's [49]. Finally, revisit intention was measured with three items, which were adopted from Verma and Chandra's [96] study.

3.2. Data Collection and Sampling

The data were collected with the assistance of an online survey company. The research company had an extensive consumer panel comprised of approximately 400,000 panel members in South Korea. A sample was drawn from the panel members who had used a SST at a restaurant. The data were collected after 1 September 2020, when the strict social distancing policy was implemented to fight against the COVID-19 pandemic. The participants were informed of the purpose of the study and assured of the confidentiality of the information. In order to increase the response rate, incentives were offered upon completion of the questionnaire through an online survey company. Using a simple random sampling method, the research company distributed emails to 2503 panelists, and 415 responses were collected. Due to missing information, seven responses were discarded for analysis. The final sample size was 408. The number of samples used in this study (n = 408) is greater than the 385 required for a 95% confidence level and a 5% sampling error. A pre-test was conducted with 10 customers with experience using SST to detect wording problems or ambiguities. The questionnaire was modified based on the feedback obtained. In addition, three research experts and two academics examined the items for measurement appropriateness, readability, and clarity.

4. Results

4.1. Profile of the Respondents

The respondents' profiles are presented in Table 1. Gender composition is as follows: 54.7% for males and 45.3% for females. Age distribution is as follows: 40 s (29.2%), 50 s or older (27.9%), 30 s (21.8%), and 20 s (21.1%). As for marital status, more than half of the respondents were married (59.6%). In terms of education, respondents with a four-year college degree or above accounted for the largest proportion (68.1%) of the sample. In terms of occupation, about 44% of the respondents were in management/office work (43.9%). Monthly household income for 32% of the respondents was between 4 million won and less than 6 million won (31.6%), followed by "2 million won and less than 4 million won" (28.4%) and "6 million won and less than 8 million won" (16.9%) (see Table 1).

Table 1. Demographic characteristics (n = 408).

Category		*n*	%
Gender	Male	233	54.7
	Female	185	45.3
Marital status	Single	157	38.5
	Married	243	59.6
	Other	8	2.0
Age	20 s	86	21.1
	30 s	89	21.8
	40 s	119	29.2
	50 s or older	114	27.9
Educational level	Below high school	74	18.1
	Undergraduate	56	13.7
	Four-year university	246	60.3
	Graduate school	32	7.8
Monthly income	Less than 1 million won [#]	11	2.7
	1 million–less than 2 million won	19	4.7
	2 million–less than 4 million won	116	28.4
	4 million–less than 6 million won	129	31.6
	6 million–less than 8 million won	69	16.9
	More than 8 million won	64	15.7
Job	Student	31	7.6
	Management/office	179	43.9
	Profession	40	9.8
	Sales/service	40	9.8
	Technical	35	8.6
	Housewife	49	12.0
	Other/unemployed	34	8.3

[#] US1$ = approximately 1300 Korean won.

4.2. Measurement Model and Measurement Invariance Test

The measurement model and structural model were assessed with SmartPLS 4, which is appropriate for describing the variance of the exogenous variables [97–99]. PLS-SEM (partial least squares structural equation modeling) is an analytical method suitable for assessing the explanatory power and predictive fit. This method maximizes variance and minimizes structural errors [100]. A measurement invariance test was performed to test the equivalence of the constructs between males and females using MICOM (measurement invariance of composite models) [98,101]. The test consisted of three steps: (a) configural invariance assessment, (b) compositional invariance assessment, and (c) equality of the composite mean values and variances [102]. If partial measurement invariance is established in steps (a) and (b), using unpooled data for cross-group comparisons is considered appropriate [103].

As shown in Table 2, male and female groups have the same construct and factor parameter coefficients. This addressed the issue of configural invariance. The values of Cronbach's alpha and composite reliabilities (CR) were found to be greater than the threshold of 0.7. This indicates a high level of internal consistency and reliability. Convergent validity was established because average variance extracted (AVE) values were greater than the acceptable threshold of 0.5.

Table 2. Measurement model.

Items	Total (n = 418)	Male (n = 233)	Female (n = 185)
Functionality	α [a] = 0.912, CR [b] = 0.934, AVE [c] = 0.740	α [a] = 0.909, CR [b] = 0.932, AVE [c] = 0.733	α [a] = 0.915, CR [b] = 0.936, AVE [c] = 0.746
The kiosk in this store works fast for processing orders.	0.883 *	0.884 *	0.882 *
The kiosk in this store allows quick payments.	0.880 *	0.854 *	0.903 *
The kiosk in this store has a clear ordering process.	0.876 *	0.883 *	0.867 *
The kiosk in this store makes ordering easy.	0.856 *	0.848 *	0.863 *
The kiosk in this store makes fewer errors.	0.802 *	0.809 *	0.801 *
Security	α [a] = 0.901, CR [b] = 0.920, AVE [c] = 0.591	α [a] = 0.901, CR [b] = 0.920, AVE [c] = 0.591	α [a] = 0.901, CR [b] = 0.921, AVE [c] = 0.592
The kiosk in this store has an information security system.	0.774 *	0.755 *	0.794 *
The kiosk in this store has a security technology capability.	0.726 *	0.726 *	0.723 *
The kiosk in this store will not pose any economic risk for payment.	0.762 *	0.779 *	0.756 *
The kiosk in this store has a secure electronic payment system.	0.794 *	0.834 *	0.748 *
The kiosk in this store complies with the Privacy Act.	0.809 *	0.817 *	0.801 *
The kiosk in this store collects only consented personal information.	0.713 *	0.709 *	0.715 *
The kiosk in this store does not provide personal information to third-party vendors without my consent.	0.761 *	0.716 *	0.805 *
The kiosk in this store makes me feel that my personal information is safe.	0.806 *	0.806 *	0.807 *
Assurance	α [a] = 0.872, CR [b] = 0.921, AVE [c] = 0.795	α [a] = 0.842, CR [b] = 0.904, AVE [c] = 0.758	α [a] = 0.907, CR [b] = 0.941, AVE [c] = 0.842
The kiosk in this store is reliable.	0.904 *	0.883 *	0.930 *
The kiosk in this store provides accurate menu information.	0.895 *	0.894 *	0.898 *
The kiosk in this store provides clear order results.	0.875 *	0.834 *	0.924 *
Enjoyment	α [a] = 0.861, CR [b] = 0.906, AVE [c] = 0.707	α [a] = 0.840, CR [b] = 0.893, AVE [c] = 0.676	α [a] = 0.886, CR [b] = 0.921, AVE [c] = 0.746
The kiosk in this store is fun to use.	0.878 *	0.851 *	0.908 *
The kiosk in this store makes me feel good.	0.878 *	0.842 *	0.911 *
The kiosk in this store has an interesting extra feature.	0.836 *	0.836 *	0.838 *
The kiosk in this store provides all the necessary information related to ordering.	0.767 *	0.757 *	0.792 *

Table 2. *Cont.*

Items	Total (n = 418)	Male (n = 233)	Female (n = 185)
Design	α [a] = 0.881, CR [b] = 0.913, AVE [c] = 0.678	α [a] = 0.875, CR [b] = 0.909, AVE [c] = 0.667	α [a] = 0.889, CR [b] = 0.918, AVE [c] = 0.692
The kiosk in this store has a nice user interface.	0.827 *	0.803 *	0.853 *
The kiosk in this store has an attractive layout.	0.814 *	0.819 *	0.812 *
The kiosk in this store has an appropriate font size.	0.816 *	0.789 *	0.843 *
The kiosk in this store has an attractive menu video.	0.847 *	0.853 *	0.842 *
The kiosk in this store has an attractive photo of the menu.	0.813 *	0.818 *	0.809 *
Convenience	α [a] = 0.903, CR [b] = 0.929, AVE [c] = 0.723	α [a] = 0.902, CR [b] = 0.927, AVE [c] = 0.718	α [a] = 0.905, CR [b] = 0.930, AVE [c] = 0.727
The kiosk in this store is easy to use.	0.881 *	0.867 *	0.895 *
The kiosk in this store makes it easy to find the menu.	0.841 *	0.862 *	0.821 *
The kiosk in this store makes ordering easy.	0.871 *	0.855 *	0.887 *
The kiosk in this store makes it easy to pay for the order.	0.870 *	0.870 *	0.869 *
The kiosk in this store is easy to change the menu.	0.784 *	0.781 *	0.786 *
Customization	α [a] = 0.884, CR [b] = 0.915, AVE [c] = 0.684	α [a] = 0.884, CR [b] = 0.916, AVE [c] = 0.685	α [a] = 0.885, CR [b] = 0.915, AVE [c] = 0.683
The kiosk in this store provides a service customized to me.	0.811 *	0.822 *	0.809 *
The kiosk in this store provides me with the information I need.	0.781 *	0.758 *	0.803 *
The kiosk in this store offers personalized coupons.	0.853 *	0.848 *	0.857 *
The kiosk in this store offers personalized discounts.	0.851 *	0.878 *	0.817 *
The kiosk in this store is known to provide services customized to me.	0.836 *	0.827 *	0.845 *
Memorable experience	α [a] = 0.852, CR [b] = 0.910, AVE [c] = 0.772	α [a] = 0.842, CR [b] = 0.905, AVE [c] = 0.760	α [a] = 0.861, CR [b] = 0.915, AVE [c] = 0.783
I will have good memories of this store.	0.898 *	0.891 *	0.905 *
I will long remember what I liked about this store.	0.895 *	0.903 *	0.885 *
I will never forget my experience at this store.	0.841 *	0.819 *	0.863 *
Revisit intention	α [a] = 0.830, CR [b] = 0.899, AVE [c] = 0.747	α [a] = 0.842, CR [b] = 0.905, AVE [c] = 0.760	α [a] = 0.818, CR [b] = 0.892, AVE [c] = 0.734
I definitely want to visit this store again.	0.891 *	0.883 *	0.900 *
In the future, I plan to visit this store.	0.882 *	0.889 *	0.873 *
I will try to revisit this store.	0.819 *	0.843 *	0.794 *

[a] Cronbach's alpha, [b] CR (Composite Reliability), [c] AVE (Average Variance Extracted). * $p < 0.01$.

Discriminant validity was well established because the square root of AVE in each latent variable was larger than other correlation values among the latent constructs (see Table 3).

Table 3. Fornell–Larcker criterion and correlation matrix.

Constructs	1	2	3	4	5	6	7	8	9
1. Functionality	**0.860** /**0.856** /**0.864**								
2. Security	0.654 * /0.647 * /0.665 *	**0.769** /**0.769** /**0.770**							
3. Assurance	0.729 * /0.685 * /0.779 *	0.684 * /0.679 * /0.691 *	**0.891** /**0.871** /**0.917**						
4. Enjoyment	0.525 * /0.524 * /0.529 *	0.592 * /0.618 * /0.569 *	0.537 * /0.499 * /0.584 *	**0.841** /**0.822** /**0.864**					
5. Design	0.641 * /0.606 * 0.680 *	0.648 * /0.659 * /0.641 *	0.643 * /0.616 * /0.678 *	0.661 * /0.673 * /0.649 *	**0.824** /**0.817** /**0.832**				
6. Convenience	0.666 * /0.683 * /0.650 *	0.639 * /0.683 * /0.603 *	0.657 * /0.655 * /0.664 *	0.604 * /0.622 * /0.59 *1	0.680 * /0.732 * /0.627 *	**0.850** /**0.848** /**0.853**			
7. Customization	0.517 * /0.560 * /0.486 *	0.617 * /0.691 * /0.556 *	0.521 * /0.503 * /0.552 *	0.624 * /0.628 * /0.621 *	0.614 * /0.682 * /0.548 *	0.645 * /0.688 * /0.608 *	**0.827** /**0.828** /**0.826**		
8. Memorable experience	0.509 * /0.567 * /0.457 *	0.560 * /0.616 * /0.504 *	0.542 * /0.578 * /0.503 *	0.559 * /0.559 * /0.567 *	0.587 * /0.576 * /0.605 *	0.515 * /0.564 * /0.472 *	0.491 * /0.584 * /0.407 *	**0.878** /**0.872** /**0.885**	
9. Revisit intention	0.488 * /0.548 * /0.434 *	0.536 * /0.589 * /0.481 *	0.538 * /0.547 * /0.527 *	0.491 * /0.474 * /0.521 *	0.491 * /0.502 * /0.479 *	0.519 * /0.547 * /0.496 *	0.439 * /0.536 * /0.344 *	0.708 * /0.745 * /0.669 *	**0.864** /**0.872** /**0.857**

* $p < 0.01$. Note: Bold numbers indicate the square root of AVE. Numbers: Total sample/males/females.

In addition, the heterotrait-monotrait (HTMT) ratio of correlations [104] values were under 0.900 (see Table 4). Compositional invariance between males and females was established because the value of the original correlation (c) was not lower than the 5.0% quantile of c_u.

Table 4. Heterotrait–Monotrait Ratio (HTMT).

Constructs	1	2	3	4	5	6	7	8	9
1. Functionality									
2. Security	0.721 /0.716 /0.728								
3. Assurance	0.820 /0.787 /0.856	0.767 /0.776 /0.756							
4. Enjoyment	0.594 /0.594 /0.593	0.670 /0.700 /0.641	0.615 /0.585 /0.649						
5. Design	0.714 /0.679 /0.751	0.724 /0.739 /0.709	0.732 /0.720 /0.748	0.759 /0.785 /0.733					
6. Convenience	0.733 /0.753 /0.715	0.703 /0.748 /0.663	0.737 /0.751 /0.731	0.683 /0.710 /0.658	0.761 /0.826 /0.695				
7. Customization	0.573 /0.625 /0.524	0.686 /0.765 /0.605	0.586 /0.581 /0.596	0.718 /0.727 /0.709	0.69 4 /0.779 /0.608	0.720 /0.772 /0.669			
8. Memorable Experience	0.576 /0.645 /0.511	0.634 /0.699 /0.564	0.620 /0.676 /0.557	0.653 /0.665 /0.643	0.676 /0.668 /0.690	0.585 /0.646 /0.531	0.563 /0.676 /0.456		
9. Revisit intention	0.558 /0.624 /0.493	0.615 /0.670 /0.549	0.625 /0.644 /0.599	0.582 /0.561 /0.608	0.572 /0.584 /0.561	0.599 /0.628 /0.574	0.512 /0.620 /0.399	0.839 /0.880 /0.792	

Numbers: Total sample/males/females.

4.3. Common Method Bias Assessment

Following Kang, Sinha, Park, and Lee's [105] procedures, this study used both procedural and statistical approaches to deal with common method bias. The procedural

method consisted of the following steps: First, based on the pre-test result, we fixed some words and sentences that were found difficult for the respondents to understand. Second, respondents were informed of the research purpose and received instructions on how to complete the survey. Third, independent and dependent variables were not listed consecutively in the questionnaire, so respondents could not guess the relationship between the variables. In addition, this study examined variance inflation factor (VIF) values based on prior research [106] for the statistical approach. The common method bias was not a problem because VIF values were lower than 3.3 (VIF males = 1.000–3.152; VIF females = 1.000–3.294).

4.4. Structural Model Assessment and Multigroup Analysis

The structural model has been estimated using the PLS-SEM with SmartPLS 4 (see Figure 2). In order to ensure that multicollinearity was not a problem, we examined the values of the variance inflation factor (VIF). They were smaller than 3.3 in both male and female groups, indicating no threat of multicollinearity. The predictive power of the model was examined with values of R^2, which were higher than 10% [107] in both male (R^2 for a memorable experience: 0.497; R^2 for revisit intention: 0.555) and female (R^2 for a memorable experience: 0.432; R^2 for revisit intention: 0.447) groups. Chin [100] offers a guideline regarding the explanatory power: 0.67 (strong), 0.33 (medium), and 0.19 (weak). Our study's models had values higher than 0.10, meeting the strong explanatory power category.

The predictive relevance of the endogenous constructs was achieved because the values of Stone–Gesser (Q^2), namely the cross-validated redundancy Q^2 values, were higher than zero in both male (Q^2 for a memorable experience: 0.449; Q^2 for revisit intention: 0.383) and female (Q^2 for a memorable experience: 0.377; Q^2 for revisit intention: 0.294) groups [107]. Finally, we examined the values of the standardized root mean square residual (SRMR). The model fit was considered acceptable because the values were lower than 0.85 [108], with 0.067 for the male group and 0.076 for the female group.

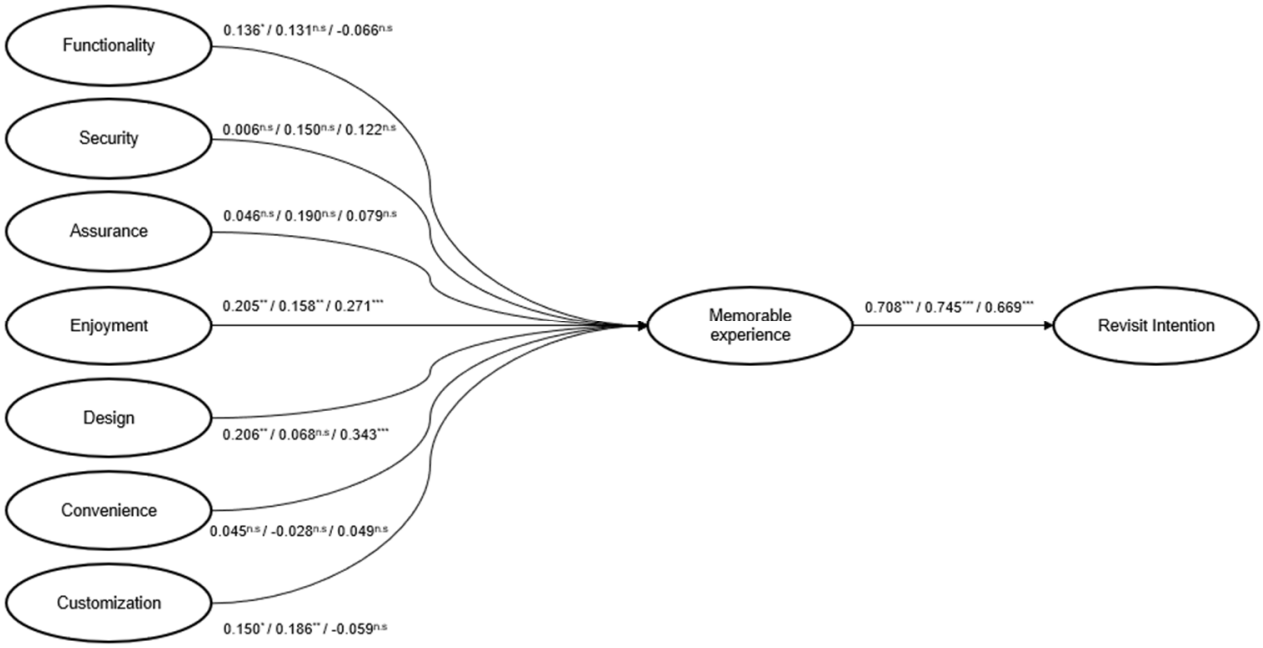

Figure 2. Estimates of the model (PLS). Note: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, n.s. = non-significant. Path estimates are presented for the total sample (n = 418), followed by males (n = 233) and females (n = 185).

The reliability and validity of the constructs in the two gender groups were examined using SmartPLS 4.0 [109]. This involved conducting three tests: (1) a measurement invariance test (step 1), (2) a compositional invariance test (step 2), and (3) an assessment of the

quality of composite mean values and variance (step 3). If only the conditions in steps 1 and 2 are met, data analysis is performed separately as the two groups exhibit differences.

As indicated in Table 2, the evaluation of configural invariance demonstrates that the two education-level groups share the same construct and factor parameters, as evidenced by Cronbach's α and composite reliability values exceeding 0.7 in both groups. Additionally, discriminant validity is confirmed across the two groups. This is evident from the higher square roots of AVE (average variance extracted) in latent variables compared to other correlation values of latent constructs (see Table 3). Furthermore, the heterotrait-monotrait (HTMT) ratios of correlation values are below 0.900 [108,109]. Moreover, compositional invariance is established as long as cu does not exceed c. Consequently, we proceeded with an MGA (multigroup analysis) to compare the path coefficients between the two groups.

4.5. Hypotheses Testing

H1 addressed the impact of seven attributes on the customers' memorable experiences. As shown in Table 5, the finding shows that functionally, design, enjoyment, and customization significantly influence customers' memorable experiences. However, security, assurance, and convenience are found to have a significant effect on the customers' memorable experiences. A gender-based analysis offers some interesting insights into how males and females respond differently. A significant difference between males and females is found in their assessments of customization and design. While males ($\beta = 0.186$, $p < 0.05$) weigh customization heavily in their assessment of the experience, females do not ($\beta = -0.059$, n.s.). This study finds that females ($\beta = 0.343$, $p < 0.01$) consider design important to their experience, but males ($\beta = 0.068$, n.s.) do not. Enjoyment is found to have a positive influence on the customers' memorable experience for both males and females (males: $\beta = 0.158$, $p < 0.05$; females: $\beta = 0.079$, $p < 0.01$). While males weigh assurance heavily in their assessment of the experience and females do not, the difference was not significant at $p = 0.05$. H2 was concerned with the impact of memorable experiences on revisit intention. This study finds that memorable experiences have a significant effect on revisit intention for both males ($\beta = 0.745$, $p < 0.01$) and females ($\beta = 0.669$, $p < 0.05$), supporting H2. H3 was related to the moderating role of gender in the relationship between seven attributes and memorable experiences. The finding shows that gender moderates the relationship between two (customization and design) of the seven attributes and memorable experiences. The effect of customization on memorable experiences is found to be significantly stronger for males than females ($p < 0.05$). In addition, design is found to have a stronger effect on memorable experiences for females than for males ($p < 0.05$).

Table 5. The comparison of the two groups (MGA).

	Total				**Male**				**Female**					
Paths	**Estimate**	**SE**	**t**	***p***	**Estimate**	**SE**	**t**	***p***	**Estimate**	**SE**	**t**	***p***	**Difference**	***p***
Functionality → ME	0.136	0.063	2.145	0.032	0.131	0.084	1.562	0.118	−0.066	0.104	0.637	0.524	0.197	0.142
Security → ME	0.006	0.070	0.084	0.933	0.150	0.102	1.468	0.142	0.122	0.098	1.246	0.213	0.027	0.853
Assurance → ME	0.046	0.065	0.709	0.478	0.190	0.074	2.570	0.010	0.079	0.103	0.769	0.442	0.111	0.381
Enjoyment → ME	0.205	0.070	2.945	0.003	0.158	0.074	2.126	0.034	0.271	0.086	3.142	0.002	−0.113	0.320
Design → ME	0.206	0.055	3.730	0.000	0.068	0.080	0.858	0.391	0.343	0.098	3.518	0.000	−0.275	0.031
Convenience → ME	0.045	0.067	0.670	0.503	−0.028	0.100	0.279	0.780	0.049	0.098	0.503	0.615	−0.077	0.575
Customization → ME	0.150	0.073	2.059	0.040	0.186	0.083	2.241	0.025	−0.059	0.084	0.704	0.482	0.245	0.042
ME → Revisit intention	0.708	0.030	23.356	0.000	0.745	0.036	20.494	0.000	0.669	0.046	14.486	0.000	0.076	0.190
	R^2	Q^2			R^2	Q^2			R^2	Q^2				
ME	0.442	0.414			0.497	0.449			0.432	0.377				
Revisit intention	0.502	0.333			0.555	0.383			0.447	0.294				
SRMR	0.065				0.067				0.076					

Note: ME stands for a memorable experience.

4.6. Importance–Performance Map Analysis by Gender

Following previous studies' guidelines [110], Importance–Performance Map Analysis (IPMA) based on gender was performed to simultaneously compare and analyze the importance and performance of the seven attributes expected to affect customers' memorable experiences. The analysis was performed with the SmartPLS 4.0 program. This analysis

tool is useful for contrasting and comparing PLS-SEM results across different groups [110] and identifying highly important variables [110,111]. The result offers further insights into which attributes restaurant companies should emphasize for males and females.

IPMA for males (see Figure 3) shows that males considered both functionality and assurance important and evaluated them positively. This result indicates that restaurant companies perform well in the areas of functionality and assurance, and they should keep up the good work. Males view design, customization, and enjoyment as important for creating a memorable experience, but their evaluations of these three attributes were negative. A general implication is that companies should concentrate their efforts on design, customization, and enjoyment to improve customers' technology use experiences.

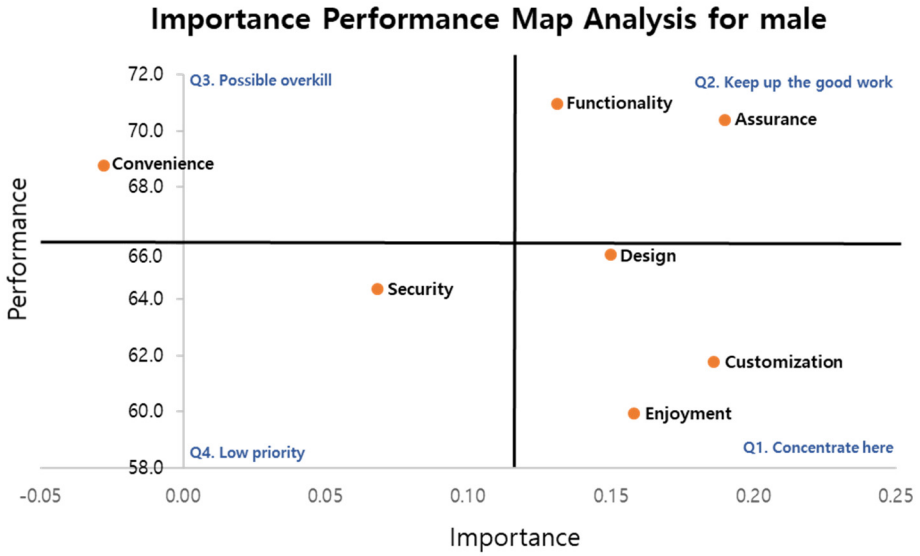

Figure 3. IPMA for males.

IPMA for females (see Figure 4) shows that females consider security more important than some other attributes, such as assurance, functionality, convenience, and customization. They believe that restaurant companies perform well on security. The two attributes that females consider important but that companies lack are design and enjoyment. This suggests that companies should concentrate their efforts on design and enjoyment in order to improve female customers' kiosk experiences.

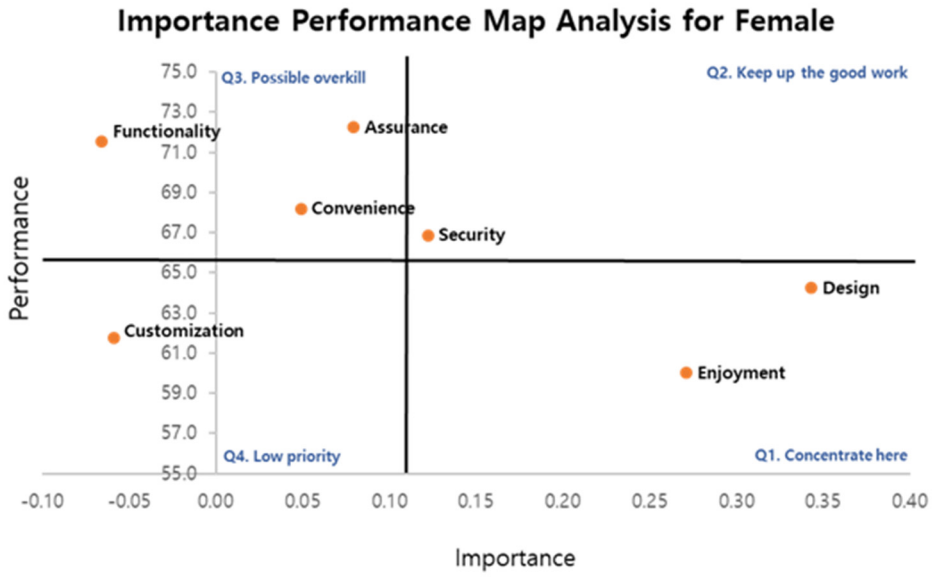

Figure 4. IPMA for females.

5. Discussion

This study investigated the effect of seven attributes of kiosks (functionality, security, assurance, enjoyment, design, convenience, and customizability) on customers' memorable experiences of using the self-service technology and revisit intention. The result shows that functionally, design, enjoyment, and customization of the seven attributes play an important role in forming the memorable experience of the kiosks, subsequently increasing revisit intention. In this context, it is important to identify the dimensions that create and shape a memorable kiosk experience. Based on previous studies, we suggested that seven attributes of kiosks (functionality, security, assurance, enjoyment, design, convenience, and customizability) will influence customers' memorable experiences. For the total sample, elements of design, enjoyment, and customization contributed to a memorable experience. These results mean that these three attributes can determine the peak experience of kiosk use.

Contrary to our expectations, functionality [22,71,72] and convenience [83,84] were not found to be significant predictors of technology use experience. It is possible that customers do not place any weight on convenience because kiosks, by nature, offer convenience. Additionally, the finding that assurance [76,77] is not related to a memorable experience indicates that consumers believe that the kiosk is a basic element that accurately delivers the promised results to users. Therefore, restaurant and kiosk managers do not need to overemphasize the functionality, convenience, and assurance of kiosks.

Meanwhile, based on gender-based analysis, the perceptions of restaurant customers depend on how they perceive the characteristics of the kiosk. The gender-based analysis shows that the weights of the attributes of kiosks differ by gender. It shows that men give more weight to customization than women, and women place more weight on design. The analysis results show that both men and women consider enjoyment important, consistent with previous studies [78–80]. The study results suggest that the management should consider different strategies regarding kiosk design and operation for men and women. The results of the IPMA show that both men and women consider enjoyment and design important, and restaurants lag in their performance on these two elements. The management should include aesthetic and fun elements when designing a kiosk. Based on the analysis of the moderating effect of gender and IPMA in this study, it implies that gender can serve as a valuable tool for market segmentation [94], particularly in relation to the experiential aspect and the adoption of technologies such as kiosks. For example, the findings that men value the customization of kiosks more than women are consistent with the results of Shao et al. [24].

Furthermore, the hypothesis that a memorable experience affects revisit intention is also supported in this study. The finding is consistent with previous studies (e.g., [62,89,90]) that memorable experiences are directly related to consumer revisit behavior. Hence, this study demonstrates the interplay between experiential kiosk attributes and memorability in shaping the post-experience behaviors of restaurant customers. In other words, the findings of this research indicate that the positive encounter with kiosk attributes generates favorable and enduring memories. These memories subsequently contribute to individuals identifying with restaurant attractions and exhibiting positive behavioral transformations. Therefore, we believe that analysis of the moderating effect of gender through RQ and IPMA expands the literature on market segmentation and acceptance of technologies, including kiosks.

6. Conclusions

The main objective of this study was to understand the role of kiosk attributes in creating a memorable experience for customers, which ultimately affects revisit intention. The research model was tested on a sample of customers who had utilized restaurant kiosks in South Korea. The finding indicates that efficient management of kiosk attributes will create a memorable experience for the customers, increasing their likelihood of revisiting the restaurants. Additionally, the study shows the moderating role of gender in the

relationship between kiosk attributes and memorable experiences. The theoretical and managerial implications of this study, the limitations of the study, and future research directions are as follows:

6.1. Theoretical Implications

This study contributes to the literature on SST by revealing the importance of kiosk technology attributes in creating memorable customer experiences. The two significant predictors that influence the experience are enjoyment and design. For male customers, assurance, customization, enjoyment, design, and functionality are considered important for their experience. Males did not place any weight on convenience or security. For female customers, design, enjoyment, and security were important factors. The finding suggests that males and females consider different attributes in evaluating the technology experience. One attribute that is relevant to both males and females is enjoyment. This indicates that the emotional aspect of using technology is an important predictor of customers' memorable experiences. Recent studies on service marketing suggest that affect or emotional response plays a critical role in determining customers' overall experience. The findings of this study are consistent with the literature that emphasizes the importance of managing customers' emotional experiences.

Another contribution of this study is related to the finding that memorable experiences with technology affect customers' intentions to revisit the restaurant. To our best knowledge, no study has attempted to examine the role of kiosk technology in instilling customer loyalty. This study suggests that a positive, memorable experience with technology helps customers return, highlighting the important role of kiosk technology in retaining customers and remaining resilient in a challenging market condition. In the post-hoc analysis involving an examination of the direct effect of technology attributes on revisit intention, most attributes were found to have no significant direct effect on revisit intention for females. The only exception was assurance, which was found to have a significant direct effect on revisit intention. This finding suggests that memorable experience plays a fully mediating role for females in the relationship between all technology attributes and revisit intention except for assurance. The fact that assurance directly influences revisit intention sheds some light on the important role assurance may play in retaining customers. Not only do customers consider assurance (i.e., reliability and ability to deliver the promised results) in assessing the technology use experience, but they also weigh assurance heavily in their decision to patronize the restaurant. This finding is consistent with prior research that supports the important role of technology's usefulness or functionality. The full mediating role of a memorable experience for most attributes suggests that an overall positive technology use experience is critical for cultivating customers' intentions to come back.

Lastly, this study provides a theoretical contribution by showing differences between males and females in their assessment of the kiosk's attributes. The two attributes that show distinct differences are customization and design. While males consider customization an important factor in influencing their memorable experience, females do not. On the other hand, females regard design as important, while males do not. The gender-based differences suggest that men and women make different assessments of kiosk technologies. Further research may be needed to investigate the underlying causes of the differences.

6.2. Managerial Implications

This study offers several managerial implications applicable to the restaurant industry. The findings based on the IPMA show that both male and female customers weigh enjoyment and design heavily in their evaluation of the technology use experience. Unfortunately, they view restaurants as not performing well on either attribute. An implication may be that kiosk developers and restaurants add some fun features or exciting materials to the kiosks so that using the technology creates an enjoyable experience. It may be helpful that marketing communication material emphasizes playfulness elements to draw customers. For example, a restaurant may offer a special event where customers are asked

to use a kiosk and play a mini-game to win a free appetizer. In addition, restaurants may want to focus on design elements, including layout, information flow, image, and font, to make information searches and transactions smooth and enjoyable. The finding that memorable experiences make customers patronize sheds some light on the important role kiosks play in customer retention.

The significant moderating role of gender in the relationship between two attributes and memorable experiences offers some important managerial implications. The significant impact of customization on memorable experiences for males suggests that restaurants should make efforts to be flexible with males by offering customizable menus and allowing different options. For example, customization of a hamburger, which is popular among male customers, may be allowed with different topping options. Another implication is related to enjoyment. Both males and females consider enjoyment important for their technology experience. The finding suggests that kiosk developers and restaurants should make customers' technology use experiences enjoyable by adding visual and audio stimuli, offering simple games to earn discounts, and making transactions smooth and effortless. In addition to enjoyment, females consider design an important factor in evaluating their experience. This finding suggests that design-related elements such as font, color, layout, aesthetics, and flow of information should be carefully considered with female customers in mind.

Finally, this study unravels the role of memorable experiences in retaining customers by showing a significant impact of memorable experiences on the customers' intention to revisit. The finding indicates that memorable experiences have a positive influence on customers' intentions to return. Restaurant companies may want to allocate appropriate resources to the development and implementation of kiosk technology in order to enhance customers' technology experiences, increase customer retention, and improve business resilience. It is apparent that dissatisfied or frustrated customers with a technology engage in such behaviors as spreading negative word-of-mouth, sabotaging, and stopping to come back [112]. Thus, restaurant companies should make proper investments in kiosk technology so that the technology delivers what it is supposed to do instead of frustrating and infuriating customers.

6.3. Limitations and Future Research Directions

The study's limitations and directions for future research are discussed as follows: First, this study examined a comprehensive set of kiosks' technology attributes and their effect on memorable experiences. Although the study makes a significant contribution to the literature by considering seven attributes, future studies may want to consider some other non-technology-related variables, such as service quality, satisfaction [7], value, and attitude toward using a kiosk. This study found some differences between males and females in their assessments of key technological attributes. However, this study could not pinpoint the underlying cause. Future studies may want to investigate what causes males and females to respond differently toward kiosks. For example, what makes males more interested in customization than females? What makes females weigh design more heavily than their male counterparts? Lastly, this study was conducted in a restaurant setting in South Korea. This requires caution when generalizing the study's findings to other industries or countries. The importance rating of kiosks' attributes may be different in other industries (e.g., airports, hotels, resorts, etc.). Future studies may want to collect data from different industries and countries and compare the results.

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