Exploring CRM through Technology-enabled Experience in Virtual Environment: The Era of COVID-19

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Abstract

Purpose: The purpose of the study is to explore the application of Augmented Reality (AR) technology to enhance interactivity and decision making via technology-enabled experience particularly, in the context of COVID-19. This study investigated effects of perceived utilitarian value, hedonic value, social value, and perceived risk on customer satisfaction with AR technology that are rarely examined in previous studies. **Research design, data and methodology:** Online survey data was used in the study. This study applied factor analysis and regression analysis to test the hypotheses and employed ANOVA and mediation effect analysis to explore additional findings. **Results:** The results suggested that customers' perceived usefulness, arousal, social preference, innovativeness, financial risk, and performance risk have statistically significant effect on customer satisfaction. **Conclusions:** The findings of the study provided managerial and policy implications to develop and advertise the introduction of AR technology with the emphasis on the practical and utilitarian benefits of the technology. The result of this study highlighted the importance of customer relationship management by providing advanced services to customers through AR technology. This study contributes to technology-enabled CRM literature by providing the empirical result to verify the assumption that AR technology can be an effective tool of firms' CRM strategy

Keywords : Customer Relationship Management (CRM), Experiential Marketing, Augmented Reality (AR), COVID-19, Customer Satisfaction

JEL Classification Code: M30, M20, M38.

1. Introduction[1]

Since e-commerce has emerged after the development of information and communication technologies (ICT), firms have implemented multichannel strategies in order to provide benefits of using both offline and online channel to customers. Customer could experience products physically through offline channel, while they could enjoy relatively greater amount of information through online channel. Both channels existed together to make customer experience as smooth as possible in customers' decision making processes

(Schoenbachler & Gordon, 2002). Kumar and Venkatesan (2005) also examined that multichannel integration strategically important for firms because multichannel customers perceive higher customer loyalty to the brand compared to customers who shop through single channel. Adoption of online channel has been increased due to the COVID-19 pandemic, while better technology should be applied to help enhance interactivity with customers and decision making. According to Statistics Korea (2020), the online shopping transaction value has increased from 12.4 trillion won to 14.2 trillion won between January 2020 and October 2020.

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Firms adopted advanced technologies to maximize customer experiences in the virtual environment and to minimize perceived risks of using online channel (Javadi, Dolatabadi, Nourbakhsh, Poursaeedi, & Asadollahi, 2012). Pine and Gilmore (2019) highlighted that the experience economy, that is crucial to compete for customer time, attention, and money and to provide memorable events for customers. Utilization of digital transformation played a key role to foster real life experiences and to build better relationships with customers. Augmented Reality (AR), Virtual Reality (VR), or Mixed Reality (MR) technologies are examples of the most recent applications of advanced technologies that help enhance customers' expectations and satisfaction by experiencing products particularly in the era of COVID-19 pandemic. Researchers in this field have recently focused on the important aspects of the effect of applying AR technology on customer behavior (Verhagen, Vonkeman, Feldberg, & Verhagen, 2014; Yim, Chu, & Sauer, 2017; McLean & Wilson, 2019; Smink, Frowijn, van Reijmersdal, van Noort, & Neijens, 2019; Yim & Park, 2019).

Nevertheless, comparatively less attention was given to exploring the effect of customers' perceived social value or perceived risk on customer behavior when advanced technology is applied in mobile shopping environment. Therefore, this study addressed how customers' experiences of advanced technology using AR affect perceived values and/or risks. This study also posits that such advanced technologies can be one of the most effective ways to provide real-like shopping experience to customers and promote their consumptions particularly in the era of COVID-19. According to Sheth (2020), contact-free consumer behavior might be continued even after COVID-19 pandemic as they discover that it can be at least as convenient as offline consumption. The purpose of this study is to explore the effect of advanced technology-enabled services, particularly AR, on customer satisfaction, purchase intention, and loyalty to interact with customers better and to improve decision making which has become important especially in the context of COVID-19. In order to achieve this goal, this research paper will attempt to answer the following questions: First, to what extent does the perceived utilitarian value of AR-enabled mobile shopping affect customer satisfaction? Second, to what extent does the perceived hedonic value of AR-enabled mobile shopping affect customer satisfaction? Third, to what extent does the perceived social value of AR-enabled mobile shopping affect customer satisfaction? Fourth, to what extent does the perceived risk of AR-enabled mobile shopping affect customer satisfaction? Fifth, to what extent does customer satisfaction affect purchase intention? Sixth, to what extent does customer satisfaction affect customer loyalty?

2. Literature Review

2.1. Customer Relationship Management (CRM)

The concept of Customer Relationship Management (CRM) emerged when the information technology was first applied by firms in order to understand better what their customers want (Galbreath & Rogers, 1999). Although CRM technologies have been developed with the presence of e-commerce, by adopting advanced technology, the current CRM technologies help build better relationship with customers. As technology has advanced, it has become possible for firms to communicate in real time with customers through interactive tools such as Chatbot (Chung, Ko, Joung, & Kim, 2020) or on social media. Woodcock, Green, and Starkey (2011) also mentioned the term social CRM, CRM with use of social media, that helps emphasize customer engagement and customer experience with social media. Besides, as data processing ability has improved, big data has been employed to analyze customer-related data and helped firms to deliver better personalized products and services to customer and to make marketing decisions more effectively (Wedel & Kannan, 2016).

According to Buttle and Maklan (2015), CRM has three dimensions: i) strategic CRM related to the development of customer-centered business strategy targeted to customer retention; ii) operational CRM concerned with the automation of processes that interacts with customers directly and the collection; and iii) analytical CRM utilized customer-related data to obtain insights about customers respectively. These dimensions are closely interrelated (Payne & Frow, 2005), therefore, multichannel integration strategy should be better utilized to better manage such dimensions. Since, multichannel customers have increased with significant portions in many industry sectors and are highly valuable to firms (McGoldrick & Collins, 2007), application of CRM helped firms improve customer relationships that also lead to better performance of firms (Navimipour & Soltani, 2016).

2.2. Experiential Marketing

Pine and Gilmore (1998) suggested the concept of experience economy to account for increasing importance of experience as a new type of economic resource in the business sector, where experience is defined as customer's memorable event. Because the emergence of this new economic entity could not be embraced by traditional marketing, Schmitt (1999) provides the concept of experiential marketing in order to overcome this limitation including the psychologically-based approach that focused on customers' sensory, affective, cognitive, physical, and social-identity experiences with firm's products and

services.

Meyer and Schwager (2007) addressed the importance of experiential marketing in CRM because it focused on customers' subjective feelings about goods or services. Although customer experience tends to be defined too all-encompassing to be practically helpful for customer experience managers in business sector (Maklan, Antonetti, & Whitty, 2017), using CRM solutions are necessary to successfully implement experiential marketing strategies (Buttle & Maklan, 2015). Therefore, experiential marketing has become significant strategies to improve customer satisfaction and to achieve the goal of CRM.

2.3. Augmented Reality (AR)

According to Haller, Billinghurst, and Thomas (2007), among various definitions of AR, the one suggested by Azuma, Baillot, Behringer, Feiner, Julier, Macintyre, et al. (2001) stated that AR system interactively associates virtual objects with real objects based on an actual environment in real time, therefore, people can alter real objects in AR environment by overlaying virtual objects. When users can modify objects in the environment that they are in, they feel as if those objects are physically present with them although the objects are virtual and at the remote place (Sheridan, 1992). Thus, AR helped improve users' feeling as virtual objects interact with them with reality. According to Ivasciuc (2020), improving the marketing plan of AR application and identifying how new technologies used can contribute to increasing the competitiveness in the context of COVID pandemic. A study by Pallavicini, Gigiolioli, Kim, Alcañiz, and Rizzo (2021) stated that the applications such as VR and AR for supporting mental health during the COVID-19 pandemic, giving insights for the adoption of remote psychology support.

AR is frequently compared with VR and MR. MR is defined as "any display in which both real and virtual images are combined in some way and in some proportion (Milgram & Colquhoun, 1999), while VR is defined as totally simulated reality constructed by computer-generated multimedia contents (Martín-Gutiérrez, Mora, Añorbe-Díaz, & González-Marrero, 2017). Milgram and Colquhoun (1999) introduced the framework of "the Reality-Virtuality (RV) Continuum" (Figure 1) and stated that i) AR lies in the part of the continuum where Real Environment (RE) is combined in greater proportion with Virtual Environment (VE); ii) VR takes one of the extremes of the continuum as VE, and MR refers to any parts of the continuum except for the two extremes of the continuum. Thus, AR combines virtual objects with physical objects and is a subclass of MR, while VR shows computer-generated objects and does not belong to MR (Milgram & Colquhoun, 1999).
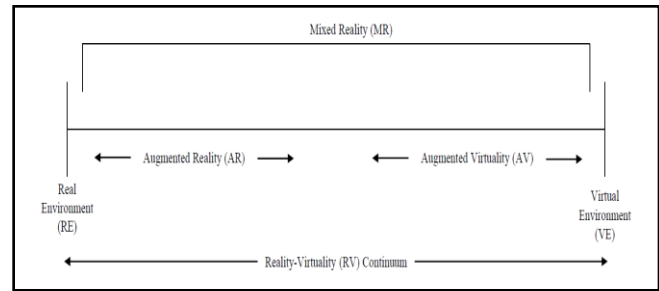
Figure 1: The Reality-Virtuality (RV) Continuum (Milgram & Colquhoun, 1999)

Unlike VR, AR can make customers feel as if they experience products in the real world when it is applied on online shopping (Verhagen, Vonkeman, Feldberg, & Verhagen, 2014). Customers prefer direct experience with products because they can enjoy more experiential contact with products compared with indirect experience (Hamilton & Thompson, 2007). For these reasons, it is generally believed that AR is more advantageous than VR in providing better shopping experience to customers (Yim & Park, 2019).

2.4. COVID-19 and Customer Behavior

According to Sheth (2020), COVID-19 pandemic restricts customers' choice of shopping place, so customers prefer online shopping to visiting brick and mortar stores. Sheth (2020) also pointed out that the pandemic situation would drive customers to catch up with digital transformation more quickly in some industries and that this would be an irreversible change as people would slowly rely on new technologies offering more convenience and better personalization. A research on meal kits, which has been popular during the pandemic to avoid grocery shopping or restaurant dining, argued that when people consume products contact-free, they considered perceived utilitarian value more strongly than perceived hedonic value, and household configuration affects order of priority between quality and diversity (Cho, Bonn, Moon, & Chang, 2020). Weining and Cheli (2020) addressed the use of innovative technologies such as VR technology platform to reduce the face to face interaction during COVID-19.

Farooq, Laato, and Islam (2020) addressed that people are more exposed to excessive amount of information about the disease and show obsessive online searching behavior out of anxiety about health. According to Laato, Islam, Farooq, and Dhir (2020), people who are over concerned about their health from fear of COVID-19 are likely to perceive the pandemic situation more severe, so they are also more l   likely to avoid contacts with others and make unusual purchases such as hoarding necessities in order to prepare for self-isolation. Huang and Sengupta (2020) also focused on the customers' fear of COVID-19,

while they discovered that customers' relative preference for typical products decreases and their relative preference for atypical products increases. Huang and Sengupta (2020) found that it is because people implicitly associate the concept of typicality with the image of many people, which they try to avoid to secure their safety from the disease in the first place.

3. Hypotheses Development

3.1. Effects of Perceived Utilitarian Value on Customer Satisfaction

The word cognitive has been associated with the words functional or utilitarian in customer behavior literature (Holbrook & Hirschman, 1982; Park & Young, 1986). According to Hansen (1981), cognitive activities are regarded as left-brain activities such as logical or analytical thinking in psychology. Among perceived utilitarian value, perceived usefulness and perceived ease of use are considered as fundamental determinants of user acceptance of information technology in the technology acceptance model (Davis, 1989). McLean and Wilson (2019) found that the perceived usefulness and the perceived ease of use positively influences customer satisfaction with AR experience. Therefore, this study hypothesized the effects of perceived usefulness and ease of use on customer satisfaction.
H1a: Perceived usefulness positively affects customer satisfaction.
H1b: Perceived ease of use positively affects customer satisfaction.

3.2. Effects of Perceived Hedonic Value on Customer Satisfaction

Holbrook and Hirschman (1982) defined hedonic consumption as customer behavior stimulated by multisensorial and emotive aspects of usage experience. Perceived hedonic values are often described with sensory and affective marketing strategies. According to Watson and Tellegen (1985), pleasantness and arousal are firmly established as the two dimensions of affection in consensual model. Perceived arousal accounted for multisensorial aspects of customer experience (Donovan & Rossiter, 1982), while perceived enjoyment accounted for emotive aspects of customer experience. A previous study by Smink, Frowijn, van Reijmersdal, van Noort, and Neijens (2019) found that customers are more satisfied with AR services when they feel more enjoyable and excited in their experience with them. Therefore, this study hypothesized the effects of perceived enjoyment and arousal on customer satisfaction.
H2a: Perceived enjoyment positively affects customer

satisfaction.
H2b: Perceived arousal positively affects customer satisfaction.

3.3. Effects of Perceived Social Value on Customer Satisfaction

Customers perceived social value when they feel that their consumption of goods or services are approved by their reference groups including friends and family, and this social influence affects customer satisfaction (Lamberton & Rose, 2012) and customer's willingness to buy (Gardete, 2015). In addition, customers are conscious of trends in their shopping in order to enhance their social identity, so they seek to consume innovative or fashionable products (Moeller & Wittkowski, 2010). Yim, Chu, and Sauer (2017) postulated that the more customers perceive AR services to be innovative, the more customers feel satisfied with AR experiences. Therefore, perceived social preference and innovativeness could be regarded as the determinants of perceived social value. Therefore, this study hypothesized the effects of perceived social preference and innovativeness on customer satisfaction.
H3a: Perceived social preference positively affects customer satisfaction.
H3b: Perceived innovativeness positively affects customer satisfaction.

3.4. Effects of Perceived Risk on Customer Satisfaction

Peter and Ryan (1976) argued that perceived risk can be defined as the expected losses or negative utility from purchase. Bobbitt and Dabholkar (2001) proposed that perceived financial and performance risks are more applicable to the study on e-commerce. Perceived financial risk involved customers' nervousness when they think that they would experience financial loss including difficulty of refund or lack of warranty from their purchase of products (Horton, 1976). The higher perceived financial risk is, the less customer feel that products are valuable (Sweeney, Soutar, & Johnson, 1999). Customers perceived performance risk when they worry that goods or services they purchase would not be able to meet their needs (Casidy & Wymer, 2016), and it negatively affects customer satisfaction (Sun, 2014). Therefore, this study hypothesized the effects of perceived financial and performance risks on customer satisfaction.
H4a: Perceived financial risk affects customer satisfaction.
H4b: Perceived performance risk affects customer satisfaction.

3.5. Effects of Customer Satisfaction on Purchase

Intention and Loyalty

Customer satisfaction has been played a key role in researches as it often leads to intention to use for the next purchase behavior and customer loyalty (Churchill & Suprenant, 1982). Wah Yap, Ramayah, and Nushazelin Wan Shahidan (2012) studied that satisfaction had a positive influence on customer loyalty through trust, which suggested that customers save their time and effort spent in shopping by choosing products or services they are satisfied with and are able to trust. Therefore, this study hypothesized the effects of customer satisfaction on purchase intention and customer loyalty.

H5: Customer satisfaction positively affects purchase intention.

H6: Customer satisfaction positively affects customer loyalty.

4. Methodology

4.1. Data Collection

Questionnaire items in the survey regarding customer perceived values, perceived risk, and customer satisfaction, purchase intention, and customer loyalty was developed and modified from previous studies (Bobbitt & Dabholkar, 2001; Casidy & Wymer, 2016; Gardete, 2015; McLean & Wilson, 2019; Smink, Frowijn, van Reijmersdal, van Noort, & Neijens, 2019; Sun, 2014; Verhagen, Vonkeman, Feldberg, & Verhagen, 2014; Watson & Tellegen, 1985). The survey data was collected through online platform Qualtrics and a total of 217 respondents completed the survey. The response rate was 0.86. Considering that perceived values and perceived risk can be formed from customers' expectation for shopping experience, the survey data included warm-up questions regarding existence of AR-enabled mobile shopping experience. In order to help understanding on AR-enabled mobile shopping experience, pictures with descriptions of the AR-enabled mobile shopping was provided prior to main questions on customer perceived values and perceived risk (Figure 2: https://apps.apple.com). Descriptions of AR-enabled mobile shopping in the survey is based on IKEA's description on IKEA Place from iOS App Store (https://apps.apple.com).
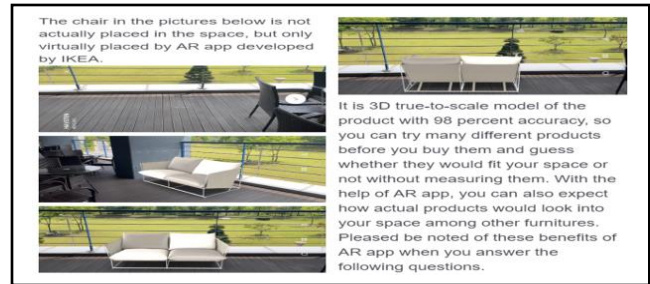
Figure 2: The Pictures (by authors) and Descriptions (adapted from App Store description: https://apps.apple.com) of AR-enabled Mobile Shopping in the Survey

This study applied IKEA Place application that shows how AR functions in the mobile application help users to experience products prior to the purchase, and there are three reasons to support this choice. First of all, according to IKEA's official homepage (www.ikea.com), IKEA Place is regarded as one of the first AR-enabled applications in home furnishing industry (www.ikea.com). It was launched in 2017 (www.ikea.com), so it has been improved with users' feedbacks for more than three years. Hence, it can be regarded that this application has various functions that users find helpful. Secondly, compared to other AR-enabled mobile applications targeting to specific age groups, gender, or income group, the user experience of IKEA Place is less sensitive to demographics including gender or income level. Therefore, it would be better to choose products and brands that everyone is familiar with so as to observe the pure effect of AR-enabled application on customer behavior as much as possible. Thirdly, through AR functions, IKEA Place can satisfy one of the most important concerns for customers, which is to check whether the furniture that they consider to buy would fit to their room size (www.ikea.com). Consequently, it would be assumed that the impact of AR-enabled application on customer behavior can be observed more apparently through IKEA Place.

The survey is written in both Korean and English, so that participants can choose the survey language that they feel more comfortable with. The validity of the equivalence between Korean survey and English survey was verified by back translation. At the beginning of the questionnaire, an explanation was given to the participants in order to let them know of the topic of the study and guarantee that all the survey data are confidential and handled anonymously. This study distributed the survey to respondents who are familiar with IKEA and intention to use IKEA Place application. The survey applied a 5-point Likert scale from 1 to 5, where 1 represents answers like "Highly Unlikely," "Strongly Disagree," or "Strongly Dissatisfied" and 5 represents answers like "High Likely," "Strongly Agree," or "Strongly Satisfied."

4.2. Results of Cronbach's Alpha Test of Reliability

This study conducted Cronbach's alpha test in order to check the reliability for each variable, and the result is summarized in the Table 1.

Table 1: Results of Cronbach's Alpha Test of Reliability for Each Variable

Factor	Variable	Cronbach's Alpha
Perceived Utilitarian Value	Perceived Usefulness	0.846
	Perceived Ease of Use	0.886
Perceived Hedonic Value	Perceived Enjoyment	0.921
	Perceived Arousal	0.895
Perceived Social Value	Perceived Social Preference	0.905
	Perceived Innovativeness	0.846
Perceived Risk	Perceived Financial Risk	0.856
	Perceived Performance Risk	0.865
Customer Satisfaction		0.881
Purchase Intention		0.897
Customer Loyalty		0.917

4.3. Methodology for Data Analysis

First of all, the research confirmed that scale items were grouped appropriately by the constructs that the items are designed to measure by applying factor analysis. Principal component analysis was used as the method for extraction with maximum iterations for convergence as 25, and factors whose eigenvalue is greater than 1 are extracted. VARIMAX with Kaiser normalization was applied as the rotation method with maximum iterations for convergence. After obtaining factor scores from factor analysis, multiple regression analysis was conducted to explore how four factors affect customer satisfaction as well as how customer satisfaction influences purchase intention and customer loyalty.

5. Data Analysis

5.1. Data Collection

Out of 217 respondents who completed the survey, 66.7% were Korean and 33.3% were international. In terms of gender, 48.8% were female and 51.2% were male. By education level, 18% had high school or less, 13.4% had 2-year associate degree, 37.8% had bachelor's degree, 30.8% had master's degree or beyond. Table 2 summarizes the demographic characteristics of the survey respondents.

Table 2: Summary of Demographic Characteristics of Survey Respondents

Characteristic		Percent (%)
Domestic	Korean	66.7
	Non-Korean	33.3
Region	Asia	89.3
	Europe	1.9
	Africa	1.9
	Oceania	1.4
	North America	5.1
	South America	0.5
Gender	Female	48.8
	Male	51.2
Marital Status	Married	38.7
	Single	59.5
	Others	1.8
Education Level	High school or below	18
	2-year associate degree	13.4
	Bachelor's degree	37.8
	Master's degree or above	30.8
Age	18-20	2.8
	21-30	45.6
	31-40	28.5
	41-50	8.8
	51-60	11
	61-65	2.3
	Over 65	1
Annual Income	Not available	39.5
	$10,000 or less	8.4
	$10,001-$30,000	20
	$30,001-$50,000	15.9
	$50,001-$70,000	6.1
	$70,001 or more	10.1

5.2. Hypotheses Testing

Factor analysis was applied to check the validity of the construct, and the result of the analysis is summarized in the Table 3 and 4.

Table 3: Component Matrix: Eight Factors of Customer Satisfaction

Factors	Components							
	1	2	3	4	5	6	7	8
PU1	.901							
PU2	.878							
PU3	.824							
PU4	.719							
PEU1		.900						
PEU2		.878						
PEU3		.854						
PEU4		.823						
PE1			.927					
PE2			.905					
PE3			.894					
PE4			.876					
PA1				.895				
PA2				.880				
PA3				.864				
PA4				.849				
PSP1					.920			
PSP2					.918			
PSP3					.868			
PSP4					.831			
PI1						.890		
PI2						.881		
PI3						.864		
PFR1							.933	
PFR2							.920	
PFR3							.805	
PPR1								.876
PPR2								.857
PPR3								.844
PPR4								.822

Note: PU = Perceived Usefulness, PEU = Perceived Ease of Use, PE = Perceived Enjoyment, PA = Perceived Arousal, PSP = Perceived Social Preference, PI = Perceived Innovativeness, PFR = Perceived Financial Risk, PPR = Perceived Performance Risk

Table 4 Component Matrix: Customer Satisfaction, Purchase Intention, and Customer Loyalty

Factors	Components		
	1	2	3
SATISFACTION1	0.886		
SATISFACTION2	0.828		
SATISFACTION3	0.819		
SATISFACTION4	0.815		
SATISFACTION5	0.793		
INTENTION1		0.941	
INTENTION2		0.922	
INTENTION3		0.874	
LOYALTY1			0.916
LOYALTY2			0.893
LOYALTY3			0.888
LOYALTY4			0.883

With factors scores obtained from factor analysis, multiple regression analysis was employed to test the hypotheses. This study conducted multiple regression analysis and the results are summarized in Table 5.

Table 5: Effects of Customers' Perceived Values and Perceived Risk on Customer Satisfaction

Variable (Independent → dependent)	Standardized Coefficient (t-value-Sig)	VIF
Perceived usefulness → Customer Satisfaction (H1a)	0.140 (2.660***)	3.013
Perceived ease of use → Customer Satisfaction (H1b)	0.016 (0.306)	2.855
Perceived enjoyment → Customer Satisfaction (H2a)	0.034 (0.544)	4.294
Perceived arousal → Customer Satisfaction (H2b)	0.201 (2.842***)	5.419
Perceived social preference → Customer Satisfaction (H3a)	0.087 (1.861*)	2.351
Perceived innovativeness → Customer Satisfaction (H3b)	0.095 (1.768*)	3.121
Perceived financial risk → Customer Satisfaction (H4a)	0.102 (1.881*)	3.157
Perceived performance risk → Customer Satisfaction (H4b)	0.363 (7.388***)	2.613

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

Overall, the ANOVA showed that the model was significant at 0.01 level with $F = 110.332$ (*r-square* = 0.814). As all variables have their VIF values smaller than 10, so this regression result is free from the issue of multicollinearity. Based on the result, H1a, H2b, H3a, H3b, H4a, and H4b were accepted except for H1b and H2a. The results suggest that customers' perceived usefulness, perceived arousal, perceived social preference, perceived innovativeness, perceived financial risk, and perceived performance risk have statistically significant effect on customer satisfaction.

This study applied regression analyses for customer satisfaction on purchase intention and loyalty (Table 6). Overall, the ANOVA for the effect of customer satisfaction on purchase intention showed that the models were significant at 0.01 level with $F = 327.835$ (*r-square* = 0.605). According to the result, H5 is accepted. Overall, the ANOVA for the effect of customer satisfaction on loyalty showed that the models were significant at 0.000 level with $F = 356.365$ (*r-square* = 0.626). According to the result, H6 is also accepted.

Table 6: Effects of Customer Satisfaction on Purchase Intention and Loyalty

Variable (Independent → dependent)	Standardized Coefficient (t-value-Sig)
Customer Satisfaction → Purchase Intention (H5)	0.778 (18.106***)
Customer Satisfaction → Customer Loyalty (H6)	0.791 (18.878***)

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

6. Conclusion

6.1. Findings

This study explored the effect of customers' perceived utilitarian value, perceived hedonic value, perceived social value, and perceived risk on customer satisfaction as well as the effect of customer satisfaction on purchase intention and customer loyalty. The factors of customer satisfaction are selected based on extant literature whose topic was customers' perceived values and perceived risk on customer satisfaction.

As a result of the study, the hypotheses H1a, H2b, H3a, H3b, H4a, and H4b were accepted, while hypothesis H1b and hypothesis H2a were not accepted, which implies that perceived ease of use and perceived enjoyment does not have statistically significant influence on customer satisfaction in AR-enabled mobile shopping environment. As the two rejected hypotheses were established according to previous studies, it is necessary to try to suggest possible reasons that explain why perceived ease of use and perceived enjoyment do not affect customer satisfaction.

In fact, it would be hard for customers to appreciate these two values without actually using AR functions in the mobile application. However, 59.4% of the current study's respondents have no experience of AR technology prior to answering the survey, so it can be considered that the lack of actual experience of AR-enabled mobile shopping environment makes people hard to associate perceived ease of use and perceived enjoyment with customer satisfaction. In addition, the factors with higher standardized coefficient values are perceived performance risk and perceived arousal. Therefore, the items used to measure perceived arousal caused by receiving more sensory information from AR functions in the mobile application affect satisfaction more strongly. Similarly, how much perceived performance risk would be reduced, but increased reality closer to actual product display by using AR technology might fit customer expectation, therefore, it affects satisfaction more strongly. Hence, the result verifies that one of the most attractive features of AR technology in the perspective of customers is to deliver richer information about the target object by real-time interaction between the real world and the virtual world. Given that the factor with the next greatest standardized coefficient value is perceived usefulness, therefore, it implied that customers also find this benefit from AR feature useful in their mobile shopping, which is in accordance with previous studies (McLean & Wilson, 2019; Yim, Chu, & Sauer, 2017).

On the contrary, perceived social values including innovativeness and perceived social preference have marginally significant effect on customer satisfaction. This result implies that although customers do not completely ignore the advantage of using AR feature in constructing better social identity, they pay more attention to functional advantages of AR technology in mobile shopping environment. Furthermore, perceived financial risk also have marginally significant effect on customer satisfaction, while perceived performance risk have the greatest effect size and is strongly significant at 1% level. One possible explanation for this result is that online customers tend to worry less about issues in exchange or refund nowadays compared to the past. By considering the greater impact of negative eWoM (Chevalier & Mayzlin, 2006), online sellers have provided better exchange or refund services to customers, which results in the improvement of average quality of exchange and refund policy. As a result, it can be regarded that customers are inclined to be less concerned about perceived financial risk and more concerned about perceived performance risk. The results provide managerial implications how customers perceive the use of AR enhance better relationships with businesses.

6.2. Relations to COVID-19

As discussed, COVID-19 affects customer behavior significantly. Because the survey data used in this research was collected in the era of COVID-19, it would be worthwhile to consider the effect of COVID-19 on customer behavior in the discussion of the result of data analysis. From the number of decreased physical presence, people have been aware that COVID-19 is dangerous enough to risk their lives. In order to practice social distancing, there has been consensus in the society to migrate social activities for hedonic motivation or develop advanced technologies such as AR for indirect experiences. Even though enjoyment is one of the major drivers of consumption, pleasure-oriented consumption is often labeled "frivolous" and brings feelings of guilt to customers (Strahilevitz & Myers, 1998). Consequently, it can be conceived that customers in the COVID-19 pandemic tend to avoid pursuing perceived enjoyment to be free from feelings of guilt as well as to deal with social pressure.

In contrast, in the risky situation, when people think that their knowledge level is insufficient to handle the situation, they become obsessed with gathering information regarding the disease and ways to guarantee their safety (ter Huurne, Griffin, & Gutteling, 2009). As consumption is not the exception, consumers in the COVID-19 pandemic try to seek for more information and judge whether products or services would be useful to protect themselves against the infection. As utilitarian consumption is emphasized greatly in the hazardous situation, it can be considered that customers pay significant attention to functional values such as perceived performance risk, perceived arousal, and perceived usefulness in the era of COVID-19. Moreover, customers

hoard necessities in the pandemic and seem to sacrifice economic costs for the sake of self-protection. Therefore, it can be suggested that customers give comparatively less consideration for perceived financial risk in the risky situation.

Besides, the context of COVID-19 can be helpful to explain the reason that perceived social preference and perceived innovativeness have marginally significant effect on customer satisfaction. Customers are inclined to avoid products or services that they expect to be preferred by many people in the pandemic, so that they can minimize contacts with others. However, at the same time, people's fear of missing out, which is related to the desire for obtaining and maintaining social recognition from their reference group (Przybylski, Murayama, DeHaan, & Gladwell, 2013) and drives people to choose for products or services that are socially preferred (Laato, Islam, & Laine, 2020). Thus, it can be regarded that these ambivalent sentiments in customer minds leads perceived social preference and perceived innovativeness to affect customer satisfaction at the marginally significant level.

6.3. Additional Findings

6.3.1. Differences in Customer Satisfaction by Customers' Individual Factors

Additionally, this study applied ANOVA to find out whether customer satisfaction varies according to customers' individual factors. Firstly, two sets of ANOVA were conducted to test whether customer satisfaction varies by acquisition of prior experience of mobile shopping and AR technology. The result of former ANOVA had F-value as 0.137 and significance level as 0.712, indicating that there is no difference in customer satisfaction by whether customer purchased products from mobile shopping before. From Levene's test of equality of error variances, F-value was 0.058 and significance level was 0.810, so the validity of ANOVA was confirmed. The result of latter ANOVA had F-value as 0.009 and significance level as 0.923, which means that customer satisfaction does not vary by whether individual experienced AR technology prior to the survey. From Levene's test of equality of error variances, F-value was 0.028 and significance level was 0.868, so the validity of ANOVA was confirmed.

Table 7: Summary of ANOVA Result: Difference of Customer Satisfaction by Geography and Gender

Variable	F-value (Sig)	Result
Geography	1.976 (0.084*)	Significant at 0.1 level
Gender	0.837 (0.389)	Not Significant
Geography*Gender	2.288 (0.326)	Not Significant

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

Additionally, a two-way ANOVA with full factorial model was conducted to test whether customer satisfaction changes by geography and gender, and the result reports that customer satisfaction differs by geography but not by gender and that there is no interaction effect between the two variables (Table 7). According to Levene's test of equality of error variances, F-value was 1.487 and significance level was 0.146, so the validity of ANOVA was confirmed.

This study also conducted a factorial ANOVA with customized model including age, education level, annual income, and the interaction term between age and annual income. The result suggests that customer satisfaction differs by annual income but not by age or education level and that interaction effect exists between age and annual income (Table 8). From Levene's test of equality of error variances, F-value was 0.984 and significance level was 0.531, so the validity of ANOVA was confirmed.

Table 8: Summary of ANOVA Result: Difference of Customer Satisfaction by Age, Education, and Income

Variable	F-value (Sig)	Result
Age	0.459 (0.914)	Not Significant
Education	0.966 (0.411)	Not Significant
Annual Income	2.191 (0.031**)	Significant at 0.05 level
Age* Annual Income	1.422 (0.065*)	Significant at 0.1 level

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

6.3.2. Additional Analysis: Effect of Perceived Ease of Use and Usefulness

This study conducted additional analysis regarding the effect of ease of use (H1b) showed different results from the previous study. From the Davis (1989) study, the model treats perceived usefulness as a mediating variable linking perceived ease of use. To test alternatively, this study followed the methodology developed by Baron and Kenny (1986) and conducted regression analyses. For the first stage, the regression analysis with independent variable as perceived ease of use and dependent variable as customer satisfaction was conducted. Overall, the ANOVA analysis showed that the models were significant at 0.000 level with $F = 217.799$ (r-$square = 0.506$), so perceived ease of use has a statistically significant effect on customer satisfaction. For the second stage, the study conducted the regression analysis with independent variable as perceived ease of use and dependent variable as perceived usefulness, which is also the mediating variable in the alternative model. Overall, the ANOVA analysis showed that the models were significant at 0.000 level with $F = 260.087$ (r-$square = 0.549$), which indicates that perceived ease of use affects perceived usefulness significantly. For the third stage, the regression model with independent variable as perceived usefulness and dependent variable as customer satisfaction was analyzed.

Overall, the ANOVA analysis showed that the models were significant at 0.000 level with $F = 281.985$ (*r-square* = 0.567), meaning that perceived usefulness influences customer satisfaction significantly. For the last stage, the study compared the simple regression model in the first step and the multiple regression model with independent variables as perceived ease of use and perceived usefulness and dependent variable as customer satisfaction (Table 9).

Table 9: Summary of Mediation Effect Analysis: Perceived Usefulness as Mediating Variable

Step	Variable (Independent → dependent)	Standardized Coefficient (t-value-Sig)
1	Perceived ease of use → Customer Satisfaction	0.711 (14.758***)
2	Perceived ease of use → Perceived usefulness	0.741 (16.127***)
3	Perceived usefulness → Customer Satisfaction	0.754 (16.792***)
4	Perceived ease of use → Customer Satisfaction	0.339 (5.402***)
	Perceived usefulness → Customer Satisfaction	0.503 (8.012***)

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

Compared to the value of standardized coefficient of perceived ease of use in the regression model in the first step, the value of standardized coefficient of perceived ease of use in the multiple regression model in the last step is smaller but still statistically significant. Therefore, based on the result of mediation effect analysis, the alternative model with perceived usefulness as the mediating variable that links perceived ease of use to customer satisfaction is verified to be valid. This result is consistent with previous studies where perceived ease of use has a statistically significant indirect effect on customer satisfaction (Sheikhshoaei & Oloumi, 2011; Yoon, 2016; Rafique, Almagrabi, Shamim, Anwar, & Bashir, 2020). In short, although perceived ease of use has no direct effect on customer satisfaction, it can be considered that it still has some degree of indirect effect on customer satisfaction.

6.3.3. Difference in Purchase Intention by Customers' Gender in the Context of COVID-19

The current study explored whether purchase intention varies according to gender by conducting independent-samples *t*-test in the COVID-19, where the test variable is the scale item related to COVID-19 and grouping variable is gender. The result of the *t*-test had t-value as 1.224 and significance level as 0.222, suggesting that customer purchase intention does not vary by gender.

6.3.4. Robustness Check in the Context of COVID-19

By taking advantage of COVID-19 related scale items measuring customer satisfaction, purchase intention, and customer loyalty, this study tested hypotheses again to find

out whether the result of hypotheses testing is consistent in the context of COVID-19. First of all, multiple regression analysis was employed to test all hypotheses except for the hypothesis H5 and the hypothesis H6. Dependent variable was the COVID-19 related item measuring customer satisfaction and the items measuring satisfaction in perceived customer values and perceived risk (Table 10). Overall, the ANOVA analysis showed that the models were significant at 0.01 level with $F = 36.135$ (*r-square* = 0.586). As all variables have their VIF values smaller than 10, so this regression result does not have the issue of multicollinearity. Based on the result, the hypotheses (H1a, H2b, H3b, H4b) are accepted, while the hypotheses (H1b, H2a, H3a, H3b, H4a) are rejected. This result suggests that customers' perceived usefulness, perceived arousal, perceived innovativeness, and perceived performance risk have statistically significant effect on customer satisfaction in the context of COVID-19.

Table 10: Effects of Customers' Perceived Values and Risk on Customer Satisfaction Regarding COVID-19

Variable (Independent → dependent)	Standardized Coefficient (t-value-Sig)	VIF
Perceived usefulness → Customer Satisfaction (H1a)	0.199 (2.922***)	2.287
Perceived ease of use → Customer Satisfaction (H1b)	-0.070 (-1.051)	2.198
Perceived enjoyment → Customer Satisfaction (H2a)	0.054 (0.796)	2.276
Perceived arousal → Customer Satisfaction (H2b)	0.300 (3.551***)	3.522
Perceived social preference → Customer Satisfaction (H3a)	0.058 (0.911)	1.978
Perceived innovativeness → Customer Satisfaction (H3b)	0.165 (2.210**)	2.736
Perceived financial risk → Customer Satisfaction (H4a)	0.051 (0.715)	2.539
Perceived performance risk → Customer Satisfaction (H4b)	0.153 (2.633***)	1.674

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

Additional regression analyses were conducted to test whether statistically significant effect of customer satisfaction on purchase intention and on customer loyalty still hold when the scale items used for the regression analyses are restricted to the ones relevant to COVID-19. For the simple regression analysis for the effect of customer satisfaction on purchase intention (Table 11), the ANOVA analysis showed that the models were significant at 0.01 level with $F = 221.002$ (*r-square* = 0.508), therefore H5 is accepted. This result indicates that the relationship between customer satisfaction and purchase intention is consistent in the context of COVID-19. Likewise, the study applied regression analysis for customer satisfaction on customer loyalty (refer to the Table 12 for the summary of the result). Overall, the ANOVA analysis showed that the models were significant at 0.01 level with $F = 186.626$ (*r-square* = 0.466). According to the result, hypothesis H6 is again accepted,

meaning that the effect of customer satisfaction on customer loyalty is still statistically significant in the era of COVID-19.

Table 11: Effects of Customer Satisfaction on Purchase Intention and Loyalty with Scale Items Regarding COVID-19

Variable (Independent → dependent)	Standardized Coefficient (t-value-Sig)
Customer Satisfaction → Purchase Intention (H5)	0.713 (14.866***)
Customer Satisfaction → Customer Loyalty (H6)	0.748 (13.661***)

*** Significant at 0.01 level, ** Significant at 0.05 level, * Significant at 0.1 level

The result summarized in the Table 10 is especially interesting for reasons when it is compared with the result of the main multiple regression result, which is summarized in the Table 5. First of all, factors that are statistically significant at 1% level in Table 5 showed the same significance level at 1% level in the context of COVID-19, confirming the validity of the result that these factors are significant determinants of customer satisfaction. Secondly, perceived innovativeness becomes statistically significant at 5% level in the Table 10, while it is marginally significant at 10% in the Table 5. The questionnaire item used for perceived innovativeness addresses customer benefits that they can enjoy only from AR-enabled mobile shopping but not from traditional mobile shopping with photo and text. Therefore, as discussed above, it can be suggested that customers' great emphasis on functional aspects of consumption in the pandemic situation explains this result. Furthermore, other factors that are marginally significant at 10% level in the Table 5, perceived social preference and perceived financial risk was not significant in the Table 10. This result might be interpreted by the idea that customers are comparatively less concerned about perceived social value or economic costs when they are in the risky situation. It can be concluded that results of robustness check by means of testing hypotheses again in the context of COVID-19 is not substantially different from the main regression results. Consequently, this consistency between two hypotheses testing confirm the validity of main results of the study.

6.4. Managerial and Policy Implications

AR technology is one of the most widespread technologies of the fourth industrial revolution along with artificial intelligence technology. In the era of COVID-19, AR technology has become particularly important as customers' experience is enhanced without presenting physical stores, but with telepresence. Changdeokgung Palace launched mobile application called Changdeok ARirang to allow people to virtually enjoy the place without physical visit (Yoo, 2020).

Moreover, combined with VR technology, the concept of Metaverse has recently emerged. Many people expect that it would be the next revolution, so many companies try to adapt themselves to this new trend. As the current study finds out, customers apply AR functions most satisfying when they perceived that the functions helped them expect the precise quality of product or service by virtually experiencing it and judge whether it would be actually useful to them. Therefore, companies should consider CRM by employing better AR technology and offering better strategies to enhance relationships with customers. For companies that already provide AR services, it would work better to emphasize how virtual experience of products can be useful to improve customer relationship and satisfaction than to emphasize other characteristics of their AR functions.

It is also possible for government to enjoy benefits of the metaverse in providing better services to citizens. Shan, Panagiotopoulos, Regan, De Brún, Barnett, Wall et al. (2015) find out that interactive communication can be effective for public organizations to build relationships with the public. Seoul City Hall opened Smart Seoul Exhibition last year to help citizens virtually experience the expected outcomes of the smart city policies by employing AR technology (Lee, 2020). Hence, it would be possible to recommend government to pay attention to deliver practical benefits from the policy when they advertise policies through AR technology, like the case of Smart Seoul Exhibition. Furthermore, as metaverse is expected to be the next changer in many sectors of the industry, institutional support is necessary to encourage companies to invest in Research and Development (R&D) for AR and other advanced technologies, so that they can utilize better in the metaverse world.

6.5. Theoretical and Practical Contribution

This study makes theoretical contribution in various aspects. First of all, the study contributes to technology-enabled CRM literature by providing the empirical result to verify the assumption that AR technology can be an effective tool of firms' CRM strategy. Secondly, even though there has been lots of previous studies on AR technology, majority of them has highlighted the technology in the perspective of either CRM or experience marketing. However, this research embraces both CRM related aspects and experience marketing related aspects of AR technology, so it provides more integrated viewpoint to consider AR technology. Thirdly, the study contributes to the extant literature on the change of customer behavior in the COVID-19 pandemic by confirming the main findings with COVID-19 related scale items of the survey. Fourthly, although perceived social value and perceived risk has been comparatively ignored previously in the customer behavior literature on AR

technology, the current research contributes to the literature by including the two variables as the additional determinants of customer satisfaction. Fifthly, this study also contributes to the existing literature on customer behavior with AR technology by extending the scope of the target group to potential users of AR technology, which has been also relatively disregarded in previous literature.

Adding to the theoretical contributions discussed above, this research can be expected to have practical contribution to managers of the firms and policymakers as reference materials for designing marketing or public relations strategies that employ AR technology or for establishing policies to support firms' R&D investment for AR and other advanced technologies.

6.6. Limitations and Opportunities for Future Research

However, this research also has some limitations. First of all, sample size of the study is comparatively small, so increasing the sample size for the future study would make the findings of the research be more capable of generalization. Secondly, most respondents of the survey answered that they were from Asia. To collect answers from more diverse regions in future research would be also helpful to yield more generalized results. Thirdly, the study analyzed customer behavior on one category of product alone, but it would be interesting to include wider range of categories of product and compare the analysis result by product groups in different categories. Fourthly, this research employs two-way ANOVA, factorial ANOVA, and mediation effect analysis to try to capture factors that indirectly affect customer satisfaction such as interaction effects between variables, but there are still limitations in this methodology. To deal with this issue, future studies can consider to apply structural equation model to pinpoint all possible indirect effects in the model. Lastly, it would be interesting to conduct the similar study in the post COVID-19 era, so that it would be possible to compare between the findings of the two studies would be possible.

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