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Effects of Consumers' Technology Readiness on Telepresence and E-loyalty toward 3D Online Shopping Mall

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Abstract

Consumer responses to 3D online shopping malls are influenced by their attitudes toward technology. This study examines the consumer differentiation according to technology readiness, compares customers with different technology readiness in terms of their perceived telepresence and e-loyalty, and examines the effect of their perceived telepresence on their e-loyalty. Samples from 300 females aged 21 to 39 were used for the final analysis. The results are as follows. First, consumers were classified into three groups, Explorers (N=72), Pioneers (N=105), and Skeptics (N=123), through factor analysis and k-means cluster analysis. Second, the Explorers evaluated the telepresence of the 3D online shopping mall higher than any other group. The Skeptics presented lower e-loyalty and perceived less telepresence in the 3D online shopping mall than the other two groups. Finally, telepresence had a significant influence on e-loyalty, as identified by the regression analysis. This verifies the effectiveness of 3D technology adopted or to be adopted by online shopping malls and demonstrates that 3D shopping malls can be a strategic alternative in the online shopping sector where competition is fierce. The results show that online shopping malls should focus on establishing 3D shopping environments with further effort to utilize the technology.

Key words: 3D online shopping mall, Technology readiness, Telepresence, E-loyalty

I. Introduction

Online shopping malls have grown rapidly over the last 10 years and are now widely adopted by consumers as a major shopping site, because they provide benefits such as time and cost efficiencies to both customers and retailers. However, competition has become more intense, as the online market has already been saturated. Considering that online shoppers can switch easily from one site to another, competition among online retailers is going to get harder (Ha et al., 2007). In addition, online malls have a critical weakness in that consumers cannot physically try on and evaluate products before making purchase decisions like they would at offline stores (Hausman & Siekpe, 2009; Song et al., 2007). As there is the uncertainty over size and fit, some consumers are still reluctant to purchase fashion items through the Internet (Park & Stoel, 2002).

Responding to the lack of customer experiences related to product examination, online retailers have begun to implement innovative technologies to improve the Internet shopping experience (Kim & Lennon, 2008). For example, several technologies, such as 3D images, virtual models and zoom-in technology have been developed and adopted. 3D views particularly can enhance

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presentation and reduce purchase risks (Then & DeLong, 1999). As 3D malls offering telepresence compensate the fault that consumers can not be in physical contact with products, these malls may be a strategic alternative. Telepresence is a simulated perception of direct experience created by a computer or other media (Coyle & Thorson, 2001). Nevertheless, many online retailers hesitate to adopt 3D technologies, because they are required to make substantial investments in building 3D malls. Hence, it is important to verify the effectiveness of to use 3D malls as a strategic alternative (Kim & Lennon, 2008).

Consumer response to 3D online shopping malls can be affected by their attitudes toward technology. As 3D malls provide unfamiliar interface compared with those of traditional online malls, consumers need to learn new manipulation skills. Therefore, technology readiness, consumer attitude toward the technology, can determine whether they view 3D sites as interesting or inconvenient. Also, e-loyalty, the positive response to 3D online shopping malls, can differ according to the technology readiness of consumers. The more convenient consumers feel in the 3D malls, the more often they visit the 3D malls. Consumers with higher technology readiness purchased high-tech pro-ducts and service twice as much as consumers with lower technology readiness did (Parasuraman & Colby, 2001). However, there are few studies that verify the relationship between technology and telepresence or e-loyalty. In other words, it is uncertain whether these 3D malls have actually drawn positive response from consumers regarding telepresence or e-loyalty.

Therefore, this study aims to examine the influence of consumers' technology readiness on their perception of online shopping malls that use 3D interfaces and on their e-loyalty. Specific objectives of this study are 1) to identify consumer groups according to technology readiness, 2) to compare customers with different technology readiness in terms of their perceived telepresence and e-loyalty, and 3) to examine the effect of their perceived telepresence on their e-loyalty.

II. Literature Review

1. Technology Readiness

The technology readiness construct refers to "people's propensity to embrace and use technology for accomplishing goals in home life and at work" (Parasuraman, 2000). The Technology Readiness Index (TRI) is developed to measure people's general belief about technology (Lin et al., 2007). Parasuraman (2000) suggests that the technology readiness construct consists of four sub-dimensions: optimism, innovativeness, discomfort, and insecurity. Optimism relates to a positive view on technology and a belief that technology provides people with increased control, flexibility, and efficiency. Innovativeness refers to a tendency to become a technology pioneer and thought leader. Discomfort comprises a perception of lack of control over technology and a feeling of being overwhelmed by it. Finally, insecurity involves distrust of technology and skepticism about its ability to work properly (Lin et al., 2007). Optimism and innovativeness, positive drivers, encourage customers to use technological products/service and to hold positive attitudes toward technology, while discomfort and insecurity, negative drivers, make customers reluctant to use technology (Lin & Hsieh, 2006). Using technology readiness, Parasuraman and Colby (2001) categorized consumers into five clusters: Explorers, Pioneers, Skeptics, Paranoids, and Laggards, as presented in <Table 1>. Meanwhile, Tsikriktsis (2004) divided consumers into four groups: Explorers, Pioneers, Skeptics, and Laggards. This shows that such catego-

Table 1. Differing beliefs of technology adoption segments identified

	Explorers (16%)	Pioneers (27%)	Skeptics (21%)	Paranoids (20%)	Laggards (14%)
Optimism	High	High	Low	High	Low
Innovativeness	High	High	Low	Low	Low
Discomfort	Low	High	Low	High	High
Insecurity	Low	High	Low	High	High

From Parasuraman and Colby. (2001). p. 59.

rization may differ according to research subjects and cluster analysis.

Studies on the relationship between technology readiness and attitude/purchase intention have also been conducted. Parasuraman and Colby (2001) found that consumers of higher technology readiness purchased more than consumers of lower technology readiness did. Lin and Hsieh (2007) suggested that technology readiness has positive influences on satisfaction with and behavioral intention toward self-service technologies. Lin and Hsieh (2006) identified that technology readiness is positively related to behavioral intentions and service quality toward selfservice technology. As such, technology readiness is deeply associated with users' technology acceptance and intention to use technology. 3D shopping malls are different from others in that 3D players offer virtual reality. As customers at the 3D malls are required to rotate, magnify and stop 3D images through mouse control, the mani-pulation schemes are different from those used on traditional shopping sites. In addition, it is a little difficult to deal with these malls because they ask consumers to participate in looking at products. In other words, as consumers rotate and magnify product images at 3D malls, the malls should make further efforts to provide more precise images and information than other players. According to Yang and Lee (2008), customers found 3D malls more challenging than 2D malls. In other words, 3D malls encourage users to realize their abilities to the maximum, and more actively engage in navigating the malls. As 3D sites demand different manipulation skills, users are expected to be affected by their technology readiness. This means that they need to be more technology-ready than others. Therefore, we may assume that technology readiness will influence consumer response toward 3D malls.

2. Telepresence

Telepresence, the extent to which one feels present in the mediated environment rather than in the immediate physical environment, is defined as the experience of presence in an environment by means of a communication medium (Steuer, 1992). With regard to Internet malls, Shih (1998) proposed that telepresence is the sense of being present at a virtual store where one can browse and shop as at a brick-and-mortar store and depends on how closely the computermediated experience simulates consumer's realworld interaction with a product. Coyle and Thorson (2001) found that perceptions of telepresence grew stronger as levels of interactivity and vividness on web sites increased. Vividness refers to the ability by which technology creates emotionich environments, while interactivity refers to the extent to which users influence the format and contents of mediated environments. According to Fiore et al. (2005), telepresence entails how closely quality and quantity of simulated sensory information about the product and the simulated product simulation ability mirror the sensory information from and interaction with the product in the real world. To sum up those studies, telepresence is defined as consumers' perception that at Internet-mediated shopping malls they feel through interactions with products as if they were at an offline store. Nevertheless, existing online shopping malls are not yet able to provide the same reality and immersion that users feel at brick-and-mortar stores (Lee & Chung, 2000).

Telepresence does have a significant influence on consumers. Song et al. (2007) showed that telepresence significantly influenced consumer fantasy, shopping enjoyment, and willingness to purchase. All these studies indicate that telepresence can help promote consumers' positive attitudes toward the Internet site and consumers' enjoyable experience while shopping on the Internet. Fiore et al. (2005) summarized that telepresence indirectly affected consumer responses by facilitating product assessment and creating pleasurable consumer experiences. Dahan and Srinivasan (2000) suggested that a three-dimensional animated presentation online could create a similar experience of a physical presntation in the traditional retail store. Li et al. (2001) saw three-dimensional simulations of products and shopping environments as creating telepresence. 3D virtual experiences have been introduced by web retailers to entice consumers to visit the site, purchase products, and become repeat visitors (Li et al., 2001). Suh and Oh (2006) found that it is critical that the model images on the online clothing shops be as similar as possible to actual models wearing the clothes. A virtual model

service that utilizes web 3D-modelling technology strengthens the sense of reality that online shopping can provide and, ultimately, user loyalty to the shopping mall. Yang and Lee (2008) also proved that in a 3D online mall, users feel as if they are in a traditional retail store and immerse themselves in it.

Hence, it can be assumed that 3D shopping malls offer higher telepresence than 2D shopping malls because their 3D graphic interface provides consumers with a similar feeling of being present at offline stores. However, the telepresence that they feel in a 3D shopping mall may be affected by their technology readiness. When consumers perceive their ability to use online shopping sites as strong, they tend to feel stronger senses of immersion (Yang & Lee, 2008); the sense of immersion is also influenced by the balance between consumers' technological capabilities and the technology levels required by a website (Lee & Suh, 2003). In sum, telepresence is assumed to be affected by consumers' acceptance of technology and abilities to use it, because consumers unfamiliar with a certain technology need to use new manipulation skills.

3. E-loyalty

The concept of brand loyalty has raised enormous interest among scholars and practitioners in the field of marketing and consumer behavior (Jenson & Hansen, 2006). Firms with large groups of loyal customers have large market share which, in turn, is associated with higher rates of return on investment (Buzzell et al., 1975; Raj, 1985; Reichheld & Sasser, 1990). Customer loyalty is defined as "a deeply held commitment to rebuy or repatronize a preferred product/service consistently in the future, thereby causing repetitive same-brand or same brand-set purchasing, despite situational influences and marketing efforts having the potential to cause switching behavior" (Oliver, 1999). Brand loyalty is a similar notion to customer loyalty, and refers to the characteristics of consumers with a strong commitment to a certain brand because they view the brand as more satisfactory than alternative brands and this evaluation is reinforced through repeated uses (Day, 1969; Jacoby & Chestnut, 1978).

Anderson and Srinivasan (2003) established the concept of e-loyalty and defined it as "the customer's favorable attitude toward an electronic business, resulting in repeated purchasing behavior." Building e-loyalty is vital to the success of e-retailers because, without loyal customers, even the most effective business model will fail, and the businesses will eventually try to satisfy the whims of only price-sensitive customers (Reichheld & Schefter, 2000). As online competition increases, attracting new customers to a site is not only more difficult but also more costly, which will drive e-retailers to reemphasize e-loyalty (Peppers & Rogers, 1997). In this situation, new e-business models must consider the value of consumers' favorable attitudes and patronage to websites.

However, when it comes to formation of loyalty, customer loyalty or brand loyalty online may differ from those in the traditional market. A consumer in a traditional environment is able to evaluate product quality prior to purchase. The physical cues that are available in the traditional environment are not present in an online environment (Alba et al., 1997; Moore & Andradi, 1996). Accordingly, it is expected that consumers' e-loyalty will be developed when they have offline-like experiences at online stores.

Nevertheless, few companies seem to have succeeded in creating e-loyalty and little research has been conducted on the mechanisms involved in generating e-loyalty on the Internet. The physical cues available in the traditional environment are not present online and products are reclassified as experience goods (Alba et al., 1997; Moore & Andradi, 1996). Three-dimensional shopping malls provide consumers with a similar feeling of being present at offline stores and complement this restriction. In other words, this feeling may enhance consumer satisfaction and e-loyalty. Jang et al. (2009) found that telepresence encouraged consumers' intention to buy and recommend the store. Such intentions will lead to increased consumer loyalty, and ultimately increased economic benefits to the store. Therefore, consumers' perception of telepresence is expected to influence their e-loyalty. Also, considering that consumers are required to put more efforts into navigating around 3D shopping malls than other websites, e-loyalty is also expected to increase when they feel more comfortable about 3D shopping malls.

Thus, it may be assumed that consumers' technology readiness affects their e-loyalty.

III. Methods

1. Research Question

This study is designed to examine consumer res-ponse to 3D online shopping malls and to propose future market strategies for 3D shopping malls. To this end, this study will be looking into different levels of perceived telepresence and e-loyalty according to consumers' technology readiness, and analyzing the relationship between telepresence and e-loyalty. Acco-rdingly, the following questions will be addressed.

Research question 1: Categorize consumers by level of their technology readiness, and examine their perceived telepresence in and e-loyalty to 3D shopping malls.

Research question 2: Examine how consumers' perceived telepresence in 3D shopping malls affect their e-loyalty.

2. Stimuli Selection

As this study aims to verify the effectiveness of 3D technology in online shopping malls as an alternative strategy for e-retailers to compete in the saturated Internet retail market, a three-dimensional online mall was chosen as the stimulus. The selected stimulus was the first Korean 3D shopping mall opened by GSeshop in July 2006, selling fashion goods. The 3D mall displays its shop and its products through 3D virtual reality technology, and actually sells products. By utilizing 3D video technology, the online mall presents different brand shops and each shop displays its products so that consumers feel as if they are in an actual department store. When consumers click any product, they can see the details of the product from every direction. This 3D mall is a two-storied building, with fashion goods and jewelry being sold on the first floor and furniture and kitchenware on the second floor. The mall displays fashion products as seen at offline stores, which enables consumers to see the fashion items from every direction. Furthermore, consumers can magnify the items to inspect them closely. In this context, we assume that consumers may be further immersed in shopping. The stimulus mentioned in this paragraph is presented in <Fig. 1>.

3. Data Collection and Analysis

For this study, data were collected from 300 women aged 21 to 39 in Seoul, South Korea, by an online research agent, Embrain, Inc., which has 1.5million online panels and unique online systems (www. embrain. com). According to the Korean Internet Security Agency (2008), female consumers in their 20s and 30s tend to be more fashion-conscious and more frequent visitors of online shopping mall than other consumer segments. Therefore, female consumers in their 20s and 30s were selected using the convenience sampling method based on panels owned by Embrain, Inc. The respondents were instructed to imagine as if they were shopping for fashion products in a 3D shopping mall. To ensure the effectiveness of this research, respondents

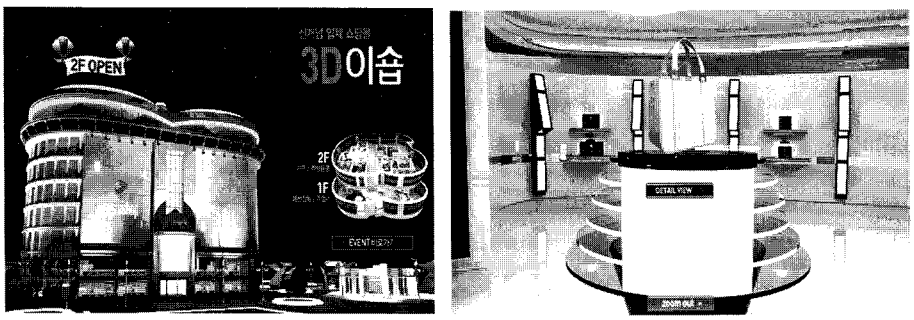

Fig. 1. 3D shopping mall stimulus.
From GSeshop. (2010). http://image.gseshop.co.kr/flash/3deshop2nd/open.html

were directed to fill the questionnaires after looking around the shopping mall for 20minutes. This time was determined based on the results of prestudy tests. Participants could start to answer the questionnaire only after 20minutes had passed. To preclude irrelevant answers, the questionnaire included a question that asked respondents to mark or write down the item that they shopped. If the described item was not being sold at the mall, the response was excluded from the survey analysis. The questionnaire consisted of 8 items about perceived telepresence, 16 items about technology readiness, and 4 items about e-loyalty, and demographic questions. Instruments for telepresence, technology readiness, and e-loyalty were modified and developed through previous studies. The collected data were analyzed using SPSS 17.0. Descriptive statistics, factor analysis, Cronbach's alpha, cluster analysis, ANOVA, Duncan test, and regression analysis were conducted.

Subjects of this study were women in their 20s and 30s who have a keen interest in fashion goods and previous online shopping experience. To be specific, 35.3% of respondents were aged 30–34, followed by aged 25–29 (29.3%); 40.3% of the respondents had paid 8 or more visits to Internet shopping malls during the previous week; and 37.8% of them said that they made 10 or more purchases online over the previous one year, followed by 1–3 purchases (36.0%) and 4–6 (17.7%). In terms of their average monthly income, 22.0% answered 3–4 million won, followed by 2–3 million won (20.7%). The majority of the respondents (59.7%) were college educated; and 41.0% were office workers and 19.7% were full-time housewives.

IV. Results and Discussion

1. Exploratory Factor Analysis and Reliability Analysis of Technology Readiness

An exploratory factor analysis was performed regarding the 16 questions about consumer technology readiness, based on the principle component analysis by Varimax rotation in order to identify factors with eigen values of 1 or over. As one question delivered an eigen value of 0.5, the question was excluded and a factor analysis reperformed. According to the analyses, four factors were identified. <Table 2> below presents the results of analysis.

Factor 1 was called "optimism" since the questions asked whether respondents used and preferred to use products and services adopting up-to-date technologies. Factor 2 was called "innovativeness" since the questions asked whether they used and liked to use cutting-edge technologies earlier than others. Factor 3 was called "insecurity" since the questions asked whether they felt secure about online financial transactions and were concerned about potential private information leakage. Factor 4 was called "discomfort" since the questions asked whether they felt taken advantage of when they received technical support online and whether they considered such support helpful. Such categorization is consistent with those of preceding studies (Lin et al., 2007; Lin & Hsieh, 2006, 2007; Parasuraman, 2000; Tsikriktsis, 2004). The overall explanatory variable was 68.08%, and Cronbach's alpha was calculated in order to verify the reliability of the measured factors. According to the reliability analysis, Cronbach's alpha (coefficient reliability) values were between 0.88 and 0.68.

2. Classification of Consumer Types by Their Technology Readiness

Based on the results of factor analysis on technology readiness, k-means cluster analysis was conducted in order to classify consumers by their technology readiness level. In this analysis, researchers are required to decide the number of clusters based on the prominence of the factor score differences between clusters (Hair et al., 2010). In this study, it was initially assumed that there would be 3–5 clusters based on the four identified factors. After examining the clusters, it was found that the attributes of the data are best represented by three clusters. As a result, three groups were identified, and both ANOVA and Duncan test as a post hoc test were performed to verify the attributes of the three groups. Test results are presented in <Table 3>.

The consumer groups identified by factor analysis and K-means cluster analysis <Table 3> are Explorers (N=72), Pioneers (N=105), and Skeptics (N=123). Cluster 1 was named Explorers since the respondents

Table 2. Exploratory factor analysis and reliability analysis of technology readiness

Factor	Item	Factor loading	Eigen value	% of variance explained	Cummulative % of variance explained	Cronbach's α
Factor 1 Optimism	I like the idea of doing business online because I need not be subject to the regular business hours.	.82	4.82	32.09	32.09	.88
	I like computer programs that allow me to tailor things to fit my own needs.	.78				
	Products and services that use the newest technologies are much more convenient to use.	.77				
	I believe that technology gives people more control over their daily lives.	.77				
	I prefer to use the most advanced technologies available.	.76				
Factor 2 Innovativeness	Among my friends, I am generally the first who adopts new technology when it appears.	.87	2.48	16.53	48.63	.82
	I can usually figure out new high-tech products and services without others' help.	.82				
	Other people come to me to ask for advice on new technologies.	.71				
	I enjoy the challenge of figuring out high-tech gadgets.	.66				
Factor 3 Insecurity	I do not consider it safe to perform any financial transaction online.	.85	1.62	10.78	59.41	.79
	I'm worried that information I send over the Internet will be seen by other people.	.82				
	I do not consider it safe to send credit card information on the Internet.	.80				
Factor 4 Discomfort	I do not consider online technical support helpful because they don't explain things in terms I understand.	.87	1.30	8.66	68.08	.68
	Sometimes, I think that technology systems are not designed for use by ordinary people.	.74				
	When I get technical support from a high-tech product or service provider, I sometimes feel as if I were being taken advantage of.	.67				

were optimistic and innovative about technology, hardly felt insecure or uncomfortable about online transactions, and thus had high technology readiness and positive views on technology. Cluster 2 was named Pioneers since they had ambivalent attitude: they had optimistic views on technology but critical views regarding the discomfort or insecurity factors. Cluster 3 was named Skeptics since they deliver little optimism, innovativeness, insecurity or discomfort, meaning that they were indifferent to technology. This result is presented in <Table 3> and differs from the results of studies done by Parasuraman and Colby (2001) and

Table 3. Results of cluster analysis based on technology readiness

Technology Readiness Factor	Cluster						*F*-value
	Explorers (N=72)		Pioneers (N=105)		Skeptics (N=123)		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Optimism	6.16[a] (A)	0.58	6.01 (A)	0.70	5.00 (B)	0.71	90.76***
Innovativeness	5.39 (A)	0.72	5.21 (A)	0.83	3.96 (B)	0.64	118.97***
Insecurity	3.75 (C)	0.92	5.93 (A)	0.73	4.58 (B)	0.84	158.22***
Discomfort	3.96 (B)	0.85	5.02 (A)	0.95	4.12 (B)	0.66	47.45***

***$p \leq .001$

Those alphabets (A, B, and C) represent the results of Duncan test (A>B>C).

[a]Average of the factors measured on a scale of 1 to 7

Tsikriktsis (2004). Unlike the previous studies, this study did not identify any Paranoid and Laggard groups as online shopping has become more common and prevalent since the previous studies were conducted and people today are more Internet-savvy. Also, it can be understood that this study surveyed those who have experienced online shopping, thus more familiar with the online environment than those of previous studies.

3. Differences in Perceived Telepresence and E-loyalty between Clusters According to Their Technology Readiness Level

Before analysis of the differences, factor analyses and reliability analyses were conducted regarding telepresence and e-loyalty. Both converged to one factor each, and the result of reliability test is presented in <Table 4.>

ANOVA was performed to test differences in the perceived telepresence and the e-loyalty among three groups, and the result is presented in <Table 5>. Duncan test was executed as a post hoc test of ANOVA. Significant differences in the perceived telepresence ($F=5.26$, $p<.01$) were found among consumer groups of different technology readiness. The Explorers evaluated telepresence of the 3D online shopping mall higher than any other group. We also found differences in the e-loyalty ($F=18.18$, $p<.001$) among the three groups. The Skeptics showed the lowest e-loyalty for the 3D online shopping mall.

These results demonstrate that an active or resistant attitude toward technology affected consumer response to the 3D online shopping mall. Those with a positive attitude toward the new technology tend to have a similar shopping experience to that of offline, and to turn loyal to the 3D online mall. However, the consumers with a negative attitude tend to feel uncomfortable about the 3D online shopping mall. These tendencies suggest that the 3D technology should be applied selectively. Retailers who want to adopt the 3D technology should consider consumer technology readiness when developing strategies. Consumers' technology readiness and e-loyalty can be improved by providing a video clip that shows how to use the 3D

Table 4. Reliability analysis of telepresence and e-loyalty

Variable	Item	Cronbach's α
Telepresence	If I actually shopped clothing online, this mall would let me easily visualize what the actual garment is like.	.94
	If I actually shopping for clothing online, this mall would give me as much sensory information about the products as I would experience in an offline store.	
	If I actually shopped clothing online, this mall would create a product experience similar to the one that I'd have when shopping in an offline store.	
	If I actually shopped clothing online, this mall would allow me to interact with the products as I would do in an offline store.	
	If I actually shopped clothing online, this mall provide accurate sensory information about the products.	
E-loyalty	I would like to recommend this shopping mall to others.	.93
	I will tell others about benefits and advantages of this shopping mall.	
	I will be willing to come back this shopping mall later.	
	If anyone ask me advice on online shopping malls, I will recommend this website.	

Table 5. Differences among technology readiness groups in telepresence and e-loyalty

	Explorers (N=72)		Pioneers (N=105)		Skeptics (N=123)		F-value
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Telepresence	5.19[a] (A)	1.24	4.91 (AB)	1.24	4.66 (B)	0.86	5.26**
E-loyalty	5.59 (A)	1.09	5.34 (A)	1.14	4.73 (B)	0.91	18.18***

**$p\leq.01$ ***$p\leq.001$

Those alphabets (A and B) represent the results of Duncan test (A>B).

[a]Average of the factors measured on a scale of 1 to 7

interface or by adopting user-friendly designs. In addition, retailers may utilize the tech-optimistic and tech-innovative Explorers as opinion leaders in order to popularize 3D malls.

4. The Effect of Consumers of Telepresence on Their e-loyalty

Finally, a regression analysis was conducted on each cluster to examine the effect of consumer perception of telepresence on their e-loyalty. The analysis found that in all groups, the perceived telepresence had a significant influence on the e-loyalty, and the result is presented in <Table 6> below. The Explorers delivered the highest standardized coefficient of 0.751, followed by Skeptics and Pioneers.

According to the analysis, when consumers perceive higher telepresence, their e-loyalty is higher. Considering that a telepresence experience at a 3D shopping mall increases consumer e-loyalty, it can be said that this analysis shows the effectiveness of 3D shopping malls. In particular, e-retailers who maintain loyal customers can boost their profitability by preventing consumers from moving to other web sites (Yang & Lee, 2010). Online players are advised to introduce 3D technology to improve consumers' perceived telepresence and eventually their e-loyalty so that they can thrive in the long run. Web site technology that provides higher quality and quantity of product information and better ability to interact with the product may cause a higher telepresence level (Song et al., 2007). To raise telepresence, it is important to make use of animation, audio, and video (Coyle & Thorson, 2001). Also, for consumers to imagine a model wearing the clothing, online shopping malls have to try to offer detailed pictures and information about fashion products (Jang et al., 2009).

V. Conclusions and Implications

As the online market gets mature, e-retailers need to find viable strategies in order to survive the fierce competition and utilize differentiated strategies based on IT. Three-dimensional technology is a competitive alternative to excel in the saturating market. 3D shopping malls display products from different angles and provide rotation and magnifying features so that they can eventually offer consumers with exper-iences similar to those of brick-and-mortar stores. In order for these 3D malls to become a firmly-established distribution medium, they must provide consumers with benefits which, in turn, increase their own profits. Therefore, this study examines how different types of consumers perceive 3D shopping malls, and discusses the direction in which 3D shopping malls may evolve to benefit both themselves and their customers. The findings of this study are described as below.

First, this study classifies consumers into three clusters according to their technology readiness through factor analysis, ANOVA and k-means cluster analysis. Cluster 1 is a group of consumers who are optimistic and innovative about technology and hardly feel insecure or uncomfortable about online transactions. This group is called Explorers because it has a positive view on technology and high technology readiness. Cluster 2 is a group of consumers who have ambivalent attitudes toward. This group is called Pioneers because it is optimistic and innovative about technology, but simultaneously feels insecure and uncomfortable about online transactions. Cluster 3 is a group of consumers who present little optimism, innovativeness, insecurity or discomfort about technology. This group is called Skeptics since it shows indifferent attitude toward technology.

Second, this study examines how consumer groups of different technology readiness perceive telepres-

Table 6. The effects of telepresence on e-loyalty by technology readiness groups

Group	Dependent Variable	Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-value	Adjusted R^2	F-value
			b	Std. Error	B			
Explorers	E-loyalty	Telepresence	.66	.07	.75	9.52***	.56	90.68***
Pioneers			.55	.08	.60	7.58***	.35	57.47***
Skeptics			.78	.07	.73	11.74***	.53	13.90***

***$p \leq .001$

ence in and e-loyalty to 3D shopping malls. Explorers perceived higher telepresence than others, and both Explorers and Pioneers presented higher e-loyalty than skeptics. This demonstrates that those who are optimistic and positive about technology are more likely to feel as if they were shopping in a brick-and-mortar store while shopping at a 3D mall, and to become loyal customers. Therefore, when e-retailers develop marketing strategies by utilizing 3D online stores, they are advised to devise segmented strategies considering consumers' technology readiness. In such cases, Explorers and Pioneers can be their target segments. Online shopping malls can also use the two groups as opinion leaders to popularize 3D shopping and their 3D malls.

Lastly, this study looked into the influence of consumers' perceived telepresence on their e-loyalty and found significant relations between them. While shopping at a 3D mall, consumers tend to develop stronger e-loyalty if the mall provides similar look and feel to that of an offline store. Therefore, 3D shopping malls need to gear further efforts in developing technologies that can provide a more realistic sense of telepresence for consumers.

Findings of this study indicate that if online shopping malls are technically able to establish the same, or at least very similar, look and feel as those of brick-and-mortar stores, they can provide positive experiences to consumers and accordingly increase their e-loyalty. In other words, 3D malls offer real-life like experiences to their customers and, in turn, secure loyal customers. This study also verifies differences in consumers' perceived telepresence and their e-loyalty between consumer groups according to their technology readiness, and suggests that e-retailers establish segment strategies. This shows the effectiveness of 3D technology for online shopping malls. Considering most online shopping malls are still based on 2D environment, this finding demonstrates that they need to gear further efforts toward adopting up-to-date technology. Also, this study has an academic significance in that it extended the study themes of online shopping mall to 3D shopping mall, whereas previous studies focused on 2D shopping mall. Our analysis can provide insight into the development of the next retail format in online shopping.

There are, however, several limitations to this study. First of all, it is necessary to verify the usefulness of 3D shopping malls based on consumer attributes other than technology readiness. For example, it can be expected that fashion innovativeness or technology innovativeness will influence consumer response to 3D shopping malls. As price, a variable that influences a consumer behavior, was excluded, future studies should consider that factor. Since 3D shopping mall, the chosen stimulus, is not yet widely used, it was difficult to select consumers who have purchased products in the mall as subjects. Therefore, follow-up studies should verify performance variables such as satisfaction. Considering that the stimulus of this study is a 3D shopping mall selling mainly fashion accessories and furniture, follow-up studies are needed to look into shops which sell clothing. It is expected that apparel stores will have greater benefits from 3D environment since fit, colors, texture and materials of clothes are critical factors to their businesses. Finally, studies comparing 3D and 2D malls would be needed in order to confirm the effectiveness of 3D malls. It is important to inves-tigate the performance of 3D malls in comparison to 2D malls from multiple aspects. That will help e-retailers to utilize 3D malls as a strategic alternative.

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