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Abstract

Avatar-equipped e-commerce is an information technology-driven business model in cyberspace. It is one of the most successful online venues developed in Korea. This research explores the process of developing customer loyalty regarding the use of Avatar in online communities and the possibility of the effective use of Avatar in electronic business development. In particular, five different social factors that affect individual users' satisfaction and loyalty are identified. This conceptualization is built on a number of theories: customer satisfaction, self-identity, social presence, social comparison, and subjective norm. The results indicate strong support for the proposed model. This study is expected to contribute to the literature by assisting managers and academics to understand the nature of customer behavior when using Avatar. The current study will also give insight to the direction of future development of information technology-driven e-commerce.

Keywords: Avatar, self-identity, user satisfaction, loyalty, social factors

Introduction

Recently in Korea, Japan, and the United States, online communities and online game providers have developed a virtual icon called Avatar, a graphical representation and articulation of a user in the virtual environment (*Business Korea* 2001). Avatar has been proven an effective advertisement and promotion tool for companies in apparel, accessories, sporting goods, and food industries, as well as celebrities and stars, and thus is regarded as one of the most successful online revenue models developed in Korea (Park 2003). There are two basic orientations of Avatar use in the e-commerce context: one for revenue generation, such as the sale of Avatar and related accessories for decoration, Avatar as a main character in online games, and chatting with Avatar as a method to show participants' personality, and the other for business facilitation, such as Avatar models in advertising, two-way interaction between Avatars within a TV program, Avatar as a guide in Internet shopping malls, and as a public communication tool.

The use of Avatar in the computer-mediated communication context is similar to the creation of "emoticons" and identities developed in virtual communities to support the social interactions (Baym 1994). While Avatar is similar to the plain symbol of the emoticons, i.e., smiley faces, and user ID in terms of self expression and unique identity of users, it is different because it is very rich in the manifestation of self so that each user can create an exact virtual image of self online that reflects positive and/or negative self-image. Hence, the understanding of the process of the use of Avatar facilitates the identification of online services (in particular, online community services) users, which is the basis for offering customized service and thus critical to the success of e-commerce.

Accordingly, the current research is designed to investigate the emergent factors driving customer satisfaction with the use of Avatar and thus affecting loyalty toward a virtual community. To address the research question, we draw upon customer satisfaction literature as the foundation of our theoretical argument (Anderson and Sullivan 1993; Igbaria and Tan 1997; McKinney et al. 2002; Szymanski and Henard 2001), and synthesize it with theories of self-construction (Butt and Langdridge

2003), social interaction (Creed et al. 2002; Fine 1994; Fulk 1993; Miranda and Saunders 2003), self-identity theory (Conner and Armitage 1998; Hogg and Terry 2000), and virtual community literature (Baym 1994).

This study is expected to contribute to the literature by allowing managers and academics to understand the nature of customer behavior when using Avatar. The current study will also give insight to the direction of future development of information technology-driven e-commerce.

Theoretical Background and Research Model

There exist a number of approaches to dealing with the use or acceptance of computer-mediated communication technology. We studied the use of Avatar in virtual communities from the perspectives of customer satisfaction and social influence. To understand the use of Avatar in online communities, an expectancy-value approach such as customer value-satisfaction-loyalty hierarchy (Melone 1990; Oliver 1997; Varki and Colgate 2001) is necessary because the creation and use of Avatar can be regarded as a process of social interaction, as well as a consumption of services. Accordingly, this study will focus on the customer value (or value criteria)–satisfaction–loyalty relationship.

The chain relationship of customer value–satisfaction–loyalty has been empirically proven in the marketing research (Oliver 1997, 1999; Olsen and Johnson 2003; Olsen 2002; Varki and Colgate 2001). Value is defined as a judgment about the quality received at a particular price (Oliver 1997; Zeithaml 1988) and thus encompasses the concept of quality (Oliver 1997, p. 167). Attitude involves the evaluation of quality as a personal determinant (Oliver 1997, p. 20) and reflects favorable or unfavorable feelings about performing a behavior (Ajzen 1985). It is necessary to take into account users' attitudes toward social influence factors addressed in the studies of computer-mediated communication as the precursor of customer satisfaction with the use of Avatar because the use of Avatar is arising in social interactions in virtual communities. Recent studies acknowledge the important role of social construction in individual user's behavior in the context of information technology. Most of these studies focus on social factors in different aspects such as subjective norm, social presence, social information processing, and social influence (Igbaria et al. 1996; Song and Zahedi 2001; Venkatesh and Brown 2001). Accordingly, this study includes as independent variables the social influence factors (self-identity, anonymity, social presence, social comparison, and external subjective norm).

Applied to our study, we argue that attitude toward anonymity and social presence and tendency to social comparison influence satisfaction when using Avatar, which determines the loyalty to the online community, as depicted in Figure 1. The rest of this section discusses each construct and its relationship with other constructs.
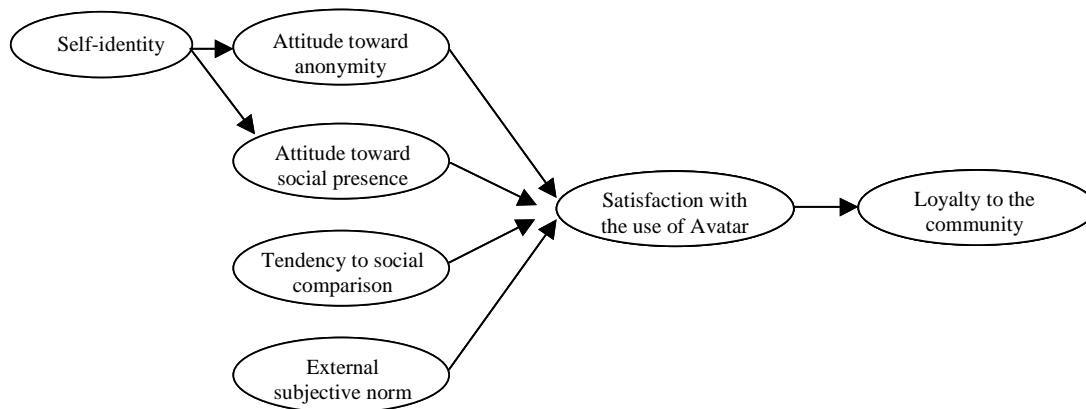

Figure 1. The Proposed Research Model

Self-Identity

In virtual communities, Avatar reflects self-identity in social interaction among participants. Self categorization theory posits the operation of the social categorization process as the cognitive basis of group behavior (Hogg and Terry 2000). The theory defines self-identity as "the salient part of an actor's self which relates to a particular behavior that reflects the extent to which an actor sees him or herself as fulfilling the criteria for any societal role" (Conner and Armitage 1998, p. 1444). In some cases, self-identity reflects social-identity defined as "the individual's knowledge that he belongs to certain social groups together with some emotional and value significance to him of this group membership" (Tajfel 1972, p. 292). This type of self-identity may explain the contextual feature of self-identity in cyberspace. Therefore, if an Avatar user in a virtual community identifies him/herself as a person who believes that the very nature of the community constitutes one's self, s/he may like the anonymous but popular virtual community. Previous studies found that self-identity has a significant impact on attitude (DeBono and Snyder 1995; Terry et al. 1999). Hence, we hypothesize

> *Hypothesis 1a*:   Self-identity positively influences attitude toward anonymity.

> *Hypothesis 1b*:   Self-identity positively influences attitude toward social presence.

The Effect of Attitude Toward Anonymity and Social Presence on Customer Satisfaction

Previous studies have examined the factors such as anonymity and social presence with regard to communication effectiveness and information sharing (e.g., Andres 2002; Carlson and Davis 1998; Keil and Johnson 2002; Miranda and Saunders 2003; Sia et al. 2002; Yoo and Alavi 2001). *Anonymity* in a computer-mediated communication environment tends to release users from social pressure and increase responsive activities (Baym 1994). In the anonymous setting, participants are likely to generate more novel (Connolly et al. 1990) and unique (Jessup et al. 1990) ideas than in the identified setting, because the anonymity allows them to take part in the discussion with less social inhibition (Jessup et al. 1990). Anonymity in the computer medium allows participants to create alternative, fictional, or sometimes multiple identities for one's self (Kalcik 1985). Anonymity also allows users of online services to express or experiment with their socially suppressed personalities (Baym 1994) or behaviors (Jessup et al. 1990). This tendency to active expression of self under anonymity leads to heavy use of Avatar as another self, real or created, and in turn to greater satisfaction with the use of Avatar.

> *Hypothesis 2:*   Individual users' favorable attitude toward anonymity has a positive influence on their satisfaction.

Social presence is the degree to which people establish close, interpersonal connections with each other during interaction in a communication setting (Fulk et al. 1990; Short et al. 1976). Social presence as a trait of communication medium was found to affect the effectiveness of communication (Miranda and Saunders 2003; Sia et al. 2002). The impact of social presence also has been studied in the context of embarrassing product purchase in the marketing and psychology area (e.g., Costa et al. 2001; Dahl et al. 2001). This theory has been applied to explain media selection behavior that affects the performance of communicators (Miranda and Saunders 2003). The theory posits that the match between the media's capability to transmit social presence and the social need for a task is critical to the effectiveness of communication (Christie 1985) because the presence of others affects the nature of intersubjective interpretation of meaning (Miranda and Saunders 2003). Hence, it may be assumed that the attitude toward social presence affects user satisfaction with the use of Avatar as indicated in the product purchase situation (Costa et al. 2001; Dahl et al. 2001).

> *Hypothesis 3:*   Individual users' attitude toward social presence has a positive influence on their satisfaction.

Tendency to Social Comparison

Social comparison is defined as the process of the assignment of value to self as a joint function of self and referent others' performance (Dakin and Arrowood 1981). Social comparison as an antecedent variable of satisfaction has been used in the marketing area to explain the fairness consumers perceive (Szymanski and Henard 2001) and the impact of a beautiful model on customers (Martin and Gentry 1997). Social comparison theory can be elaborated through equity theory (Conner 2003) which is heavily used in the marketing literature (Oliver 1997; Olsen and Johnson 2003; Szymanski and Henard 2001). Equity can be understood in the three aspects of distributive justice, procedural justice, and interactional justice (Oliver 1997). Distributive

justice is determined by the relative amount of output to input individuals invest, while procedural justice is the degree to which an individual participates in a decision or activity. Finally, interactional justice is the degree to which an individual feels s/he has been treated in a fair manner.

An individual who holds a strong tendency to compare their situation and outcome with those of others may prefer the use of Avatar in cyberspace, because cyberspace allows members to show whatever they want to show to other members without limitation in the form of Avatar (distributive justice) and the creation of Avatar solely depends on the decision of the user (procedural justice). In the virtual community, everybody treats the others in a fair manner, if the member does not violate the norm or rule of the community (interactional justice).

> *Hypothesis 4:*   Individual users' tendencies to social comparison have a positive influence on their satisfaction.

External Subjective Norm

Social influence from internal referents is accounted for by the theory of planned behavior, which includes decision makers' subjective norms related to their "cohesive" referents, such as family, friends, and colleagues (Ajzen 1985; Conner and Armitage 1998). It is natural to extend the concept of internal referents to external referents to explain isomorphic behavior of mimicking external referents that may not have close relationships with the individual. Brown and Reingen (1987) found that active information-seeking and modeling behavior from external referents is also tightly connected to strong social relationships. Using external referents to explain individual behaviors is more powerful under certain conditions, such as insufficient information, low credibility, or a high requirement of social approval (Engel et al. 1995, p. 726).

In this study, we define external subjective norm as individual users' perceptions about norms and opinions of external referents who are believed to know and have used the Avatar service. We distinguish external subjective norm from the *internal* subjective norm originally proposed in the theory of planned behavior (TPB). The external subjective norm relates to social compliance without necessarily internalizing the norm (Allen 1965; Nail 1986). As discussed earlier, the use of Avatar is developing in social interactions among members in a virtual community. Each member may have their own external referent group which may have its own Avatar and be satisfied with the use of Avatar. Also, a user may strongly want to use Avatar because s/he desires to gain acceptance from the external reference group and is already assimilated to the group norm.

> *Hypothesis 5:*   Individual users' favorable subjective norms have a positive influence on their satisfaction.

Customer Satisfaction and Loyalty

User satisfaction is defined as "the sum of one's feelings or attitudes toward a variety of factors affecting that situation" (Galletta and Lederer 1989). It also has been defined in information systems research as "felt need, system acceptance, perceived usefulness, feelings about the information system, and information systems appreciation" (Ives et al. 1983). While these terms are different, they deliver a common notion that user satisfaction is a form of evaluative response from information systems users (Melone 1990). In particular, the use of Avatar is regarded as the consumption of a service on the Internet, where customer satisfaction is defined as pleasurable need fulfillment (Oliver 1999). Hence, to further the discussion on the relationship between customer satisfaction and loyalty, the current paper takes pleasurable fulfillment experienced by Avatar users as a working definition of customer satisfaction.

Loyalty is defined as a serious commitment to repurchase or repatronize a preferred product or service in the future in a consistent manner, regardless of situational factors possibly causing switching behavior (Oliver 1997, p. 392). Consumer loyalty is an outcome of customer satisfaction (Oliver 1997; Szymanski and Henard 2001). This relationship is explained by affect-behavior hierarchy under expectancy-value theory (Eagly and Chaiken 1998) because satisfaction is an affective evaluation about the use of a product or service and loyalty is more like repeating purchase behavior (Szymanski and Henard 2001). The current research follows the relationship between customer satisfaction and loyalty and postulates a positive association between them.

> *Hypothesis 6:*   Individual user's satisfaction has a positive influence on loyalty toward a community.

Methodology

The research model was tested in the context of a simulation of actual Avatar use. The subjects of this study were asked to join one of three online communities and actually use the Avatar offered by one of the communities. The survey was given as a part of their assignment. The instructor distributed the survey questionnaire to all students who took a core course of Management Information Systems and checked the actual usage by asking seven items regarding the details of the service students used. It was expected that few of the respondents would have already used the Avatar service, while most would be familiar with the general features of a chatting environment.

In all, 134 upper-level undergraduates participated in the survey. The use of undergraduate students in this study was logical because a primary focus of this research is on understanding the behavior regarding the use of Web-based service and college students are the present and future consumers of Web technology. It should be pointed out that major users of the Web are individuals who have a college degree and are 16 to 44 years old (Hoffman et al. 1996), which is similar to the subject pool used in this study. The range of the respondent age is from 19 to 49 years old, and the average age was 21.1 years (age range from 19 to 21 is 85 percent of the population). The subjects were fairly evenly split between males and females. Respondents were asked to rate the extent of their experience with computers and with the Web in general on a scale of 1 to 7, with 1 being a novice and 7 being an expert. This group of subjects considered themselves to be relatively experienced users of computers (4.6) and just about average on their use of the Web (4.0).

Operationalization of Research Variables

In this study, we report on the instrument development, the pilot study, and on the first round of data collection for checking the measures and for testing the model. The scales for measuring these constructs were developed based on literature review to ensure the content validity of the instrument, as reported in Table 1. The instruments are reported in Appendix A.

Reliability and Validity

We first carried out the exploratory factor analyses to assess initial validity that showed no significant cross loading. The results of exploratory factor analysis (EFA) indicated that there were six different factors for all independent constructs and no cross loading above 0.40 (McKnight et al. 2002).

Table 1. Construct Definition and Sources for Item Development

Constructs	Operational Definition	Sources
Self-identity	Belief about self in conjunction with the community s/he uses the Avatar	Sparks and Shepherd (1992)
Anonymity	Like or dislike freedom from social inhibition or social pressure	Jessup et al. (1990)
Social presence	Like or dislike the establishment of close, interpersonal connections with each other during the interaction in a communication setting (anonymous or identified).	Fulk et al. (1990); Short et al. (1976); Yoo and Alavi (2001)
Social comparison	Tendency to compare one's outcome with that of other participants in terms of distributive justice, procedural justice, and interactional justice	Dakin and Arrowood (1981); Oliver (1997)
External subjective norm	Perceived social pressure generated by the reliance on knowledgeable person's opinion in an attempt to avoid unsatisfactory experiences	Ajzen (1991); Song and Zahedi (2001); Taylor and Todd (1995)
Satisfaction	Pleasurable fulfillment experienced by Avatar users (satisfied or not unsatisfied)	Oliver (1999)
Loyalty	A serious commitment to repurchase or repatronize a preferred product/service in the future in a consistent manner, regardless of situational factors possibly causing switching behavior	(Oliver 1997)

Table 2. Reliability Measures for Model Constructs

Constructs	Cronbach alpha	CFR[a]	AVE[b]
Self-identity (SEID)	0.89	0.86	0.61
Anonymity (A)	0.61	0.79	0.66
Social presence (SP)	0.83	0.86	0.67
Social comparison (SC)	0.90	0.90	0.75
External subjective norm (ESN)	0.85	0.78	0.64
Satisfaction (SATIS)	0.94	0.96	0.85
Loyalty (LOYAL)	0.86	0.91	0.72

[a]Composite factor reliability   [b]Average variance extracted

Table 3. Confirmatory Factor Analysis: Measurement Model

Constructs	Items	Loading	t-value	R_2
Self-identity	SEID1	0.93	9.32	0.65
	SEUD2	0.98	14.15	0.78
	SEID3	1.00	0.00	0.65
	SEID4	0.85	10.32	0.59
Anonymity	A1	0.74	3.59	0.29
	A2	1.00	0.00	0.68
Social pressure	SP1	1.00	0.00	0.52
	SP2	0.94	11.08	0.69
	SP3	0.97	9.15	0.75
Social comparison	SC1	0.96	14.64	0.74
	SC2	0.85	13.41	0.75
	SC3	1.00	0.00	0.78
External subjective norm	ENS1	0.96	9.93	0.70
	ESN2	1.00	0.00	0.77
Satisfaction	SATIS1	0.77	12.75	0.65
	SATIS2	1.00	0.00	0.91
	SATIS3	0.99	31.47	0.94
	SATIS4	0.82	14.56	0.69
Loyalty	LOYAL1	0.63	8.24	0.55
	LOYAL2	0.71	12.17	0.68
	LOYAL3	1.00	0.00	0.68
	LOYAL4	0.77	14.40	0.59

[a]Due to page limitations, the insrument is available upon request from the authors.

Table 4. Fit Indices for the Measurement Model and Estimated Model

Goodness of Fit Indices	Measurement Model	Estimated Model	Recommended Cut-off
Normed χ^2 (χ^2/d.f.)	1.33	1.47	Below 3
CFU	0.96	0.95	Above 0.90
TLI	0.96	0.94	Above 0.90
GFI	0.87	0.84	Above 0.90
AGFI	0.84	0.81	Above 0.80
RMSEA	0.05	0.06	Below 0.06
SRMR	0.05	0.09	Below 0.10

The reliability of first-order constructs was measured using Cronbach's alpha, composite factor reliability (CFR), and average variance extracted (AVE) and are reported in Table 2. All Cronbach's alpha values are well above the threshold of 0.70 except anonymity. Similarly, all CFR values are well above the cut-off value of 0.70 and all AVE values are well above the cut-off value of 0.50 (Segars 1997), together providing support for the reliability of the constructs.

We also carried out confirmatory factor analysis (CFA) for establishing the convergent validity. The CFA factor loadings, t-values, and item R^2 are reported in Table 3. The correlation matrix for the items is reported in Appendix B.

We used *Mplus* software developed by Muthén and Muthén (2003) for the estimation of the measurement model and the SEM estimation of the research model. The high values for factor loadings support convergent validity for the constructs. Furthermore, the t-values for factor loadings of manifest variables were well above 2.0 as shown in Table 3, supporting the statistical significance of factor loadings (Muthén and Muthén 2003). The measurement model fit indices are reported in Table 4. The normed χ^2 was 1.33, which is desirably below the cut-off value of 3.0 (Krause et al. 2000). RMSEA was 0.05, below the 0.06 cut-off (Hu and Bentler 1999), indicating a satisfactory model fit. CFI and TLI indices were 0.96, both above the cut-off value of 0.90 for the continuous outcomes case (Bhattacherjee 2002; Hu and Bentler 1999; Krause et al. 2000). GFI is below the recommended threshold, but AGFI is 0.84, which is above the cut-off value of 0.80 (Gefen et al. 2000). These results suggest that the measurement model adequately fits the data.

Furthermore, following the procedure suggested by Gefen et al. (2003), we assessed discriminant validity by comparing original measurement model (CFA) with seven latent variables against other measurement models with seven constructs, which included every possible combination of collapsing two constructs into one. While the fit indices of the estimated models suggests an acceptable fit to the data as reported in Table 4, the χ^2 value in the original CFA was significantly better (smaller) than all combinations of the reduced measurement models. Table A1 in Appendix A indicates that there exists a sound discriminant validity.

Discussion and Concluding Remarks

The estimation results of the research including the estimated model parameters, their t-values, and R^2 values for constructs are shown in Figure 2. The results show that, as hypothesized in H1a, H1b, H2, H3, H4, and H5, Web customers' loyalty to the community in Avatar is significantly influenced by satisfaction and, in turn, the satisfaction by attitude toward anonymity and social presence and tendency to social comparison, all with t-values well above 2.0, and the signs as hypothesized. Also, anonymity and social presence are formed by self-identity. However, we did not find external subjective norm to have a significant impact on satisfaction (as suggested in H5). The major reason external subjective norm does not appear to affect satisfaction with the use of Avatar may be that the use behavior is quite personal and users do not like social pressure from others regarding the selection and use of a specific Avatar in the virtual community (Jessup et al. 1990). In addition, although the role of external subjective norm plays an important role in the social interaction aspect of virtual community, its effects are generally considered minimum as found in the previous literature (Ajzen 1991).
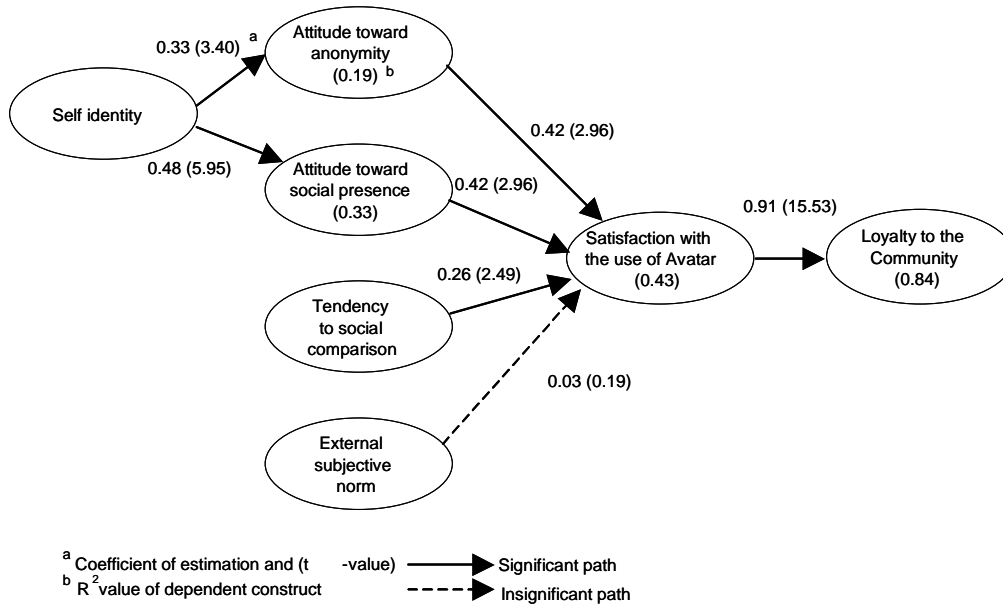
Figure 2. The Estimated Model

In summary, the results indicate that people who think they are a part of a virtual community have a positive attitude toward anonymity and like the presence of other members. In turn, people who have positive attitudes toward anonymity and social presence and tend to compare their returns with those of other members are most likely to be satisfied with the use of Avatar service in a virtual community. These satisfied people also have a great desire to patronize the community ($R^2 = 0.84$)

This study investigates the phenomenon of the use of Avatar in online communities and identifies several attitudes toward social influence factors under the framework of value–satisfaction–loyalty. This study relies on self-construction and customer satisfaction literature to examine the impact of antecedent variables including self-identity, attitude toward social presence, attitude toward anonymity, tendency to social comparison, and external subjective norm on the use of Avatar. Furthermore, we identified the outcome of satisfaction with the use of Avatar such as customer loyalty in terms of the implications of Avatar for e-commerce development.

This study has theoretical implications. We provide a significant and straightforward conceptual model for explaining the use of Avatar forming customer satisfaction, which could be easily extended to other types of e-commerce operations with considering social aspects. Furthermore, our conceptual model could be a basis for developing the feedback effect of continuous use of Avatar over time through which the dynamics of customer satisfaction and loyalty may be investigated.

This study also has significant implications for practitioners. The model may contribute to managers' understanding of the nature of customer behavior with using Avatar and thus the information technology-driven business. It is a typical technology-driven e-commerce to generate revenue from selling the accessories used to decorate Avatar. To this end, companies should understand user characteristics such as their tendency to compare and attitude toward anonymity. This understanding may help companies develop community environments favorable to users' taste by allowing clear comparison of the Avatars of users or anonymous access to chat rooms. Moreover, based on the Avatar use behavior of their customers, e-businesses may develop proper methods to enhance customer satisfaction and loyalty. Imagine an athletic shoe company provides Avatar to its customers. The Avatar may include all information about a specific customer, act as a model to try various types of shoes, and collect all the mileage information and benefits. If customers are allowed to decorate their Avatar and use it on associated Websites, Avatar may change shopping practices on the Web.

The current research suggests many extensions for future work. First, data collection regarding loyalty may be administered at different times to clarify the effect of satisfaction with Avatar use on loyalty without being corrupted by recency effect. This is mainly because anyone who has had a negative or positive experience with the use of Avatar may over-react as shown in the coefficient of 0.91 between satisfaction and loyalty. A sound measure of actual loyalty is when someone returns at a later date, rather

than a promise to return. Second, to measure satisfaction, we rely on perception-only measures, which have been accepted widely in previous studies. However, measuring the satisfaction through a confirmation/disconfirmation framework may provide additional insight to understanding the acceptance of Avatar service. Third, future research may focus on a commercial use of Avatar as a business facilitator rather than use in a virtual community. Pursuing this avenue will contribute to practitioners understanding of the behavior of e-commerce users.

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Appendix A. Instruments

All items were measured on a seven-point Likert scale (1: Strongly disagree, 7: Strongly agree)

Self-identity
SEID1   I am a person who considers the community in which I use Avatar important.
SEID2   I am a person who sees myself as belonging to the community in which I use Avatar.
SEID3   I am a person who criticizes the community in which I use Avatar.
SEID4   In general, I feel that I fit very well as a member of the community in which I use Avatar.

Anonymity
A1   Doing something without showing my real identity in a virtual community is extremely wise.
A2   Being part of an anonymous discussion where there is less social inhibition is extremely beneficial.

Social Presence
SP1   Establishing interpersonal connections with other people during online communication is extremely wise.
SP2   Having a social interaction with other people in the community is extremely beneficial.
SP3   Making a friendly interaction with other people in the community is extremely pleasant.

Social Comparison
SC1   I always compare my Avatar to that of other members to check which is more attractive.
SC2   I always evaluate the efforts I put in my Avatar relative to those of other.
SC3   I usually judge the attractiveness of my Avatar against that of others.

External Subjective Norm
ESN1   Experts, whose comments I rely on for the use of Avatar in this community, have provided supporting evidence for use.
ESN2   My friends, whose opinions I think are important for the use of Avatar in this community, have provided supporting evidence for use.

Satisfaction
Satis1   I am satisfied with my decision to use Avatar.
Satis2   I have truly enjoyed Avatar.
Satis3   I am happy that I am using Avatar.
Satis4   I am sure it is the right thing to use Avatar.

Loyalty
Loyal1 The community in which I use Avatar has more benefits than others in its class.
Loyal2 I have grown to like the community in which I use Avatar more so than other communities.
Loyal3 I intend to continue using Avatar in the future.
Loyal4 When I have a need for a community of this type, I use only the community in which I use Avatar.

Table A1. Pariwise Discriminant Analysis of Constructs*

Models	χ^2_{df}	χ^2 difference from original
Original measurement model	$\chi^2_{188} = 249.35$	–
Loyalty and satisfaction	$\chi^2_{194} = 284.18$	34.83
Loyalty and anonymity	$\chi^2_{194} = 276.31$	26.96
Loyalty and social presence	$\chi^2_{194} = 337.92$	88.57
Loyalty and social comparison	$\chi^2_{194} = 397.47$	148.12
Loyalty and subjective norm	$\chi^2_{194} = 333.14$	83.79
Loyalty and self-identity	$\chi^2_{194} = 360.98$	111.63
Satisfaction and anonymity	$\chi^2_{194} = 279.86$	30.51
Satisfaction and social presence	$\chi^2_{194} = 360.57$	111.22
Satisfaction and subjective norm	$\chi^2_{194} = 444.59$	195.24
Satisfaction and comparison	$\chi^2_{194} = 365.27$	115.92
Satisfaction and self-identity	$\chi^2_{194} = 415.47$	166.12
Anonymity and social presence	$\chi^2_{194} = 272.41$	23.06
Anonymity and social comparison	$\chi^2_{194} = 292.45$	43.10
Anonymity and subjective norm	$\chi^2_{194} = 278.55$	29.20
Anonymity and self-identity	$\chi^2_{194} = 290.38$	41.03
Social presence and social comparison	$\chi^2_{194} = 391.56$	142.21
Social presence and subjective norm	$\chi^2_{194} = 339.97$	90.62
Social presence and self-identity	$\chi^2_{194} = 343.92$	94.57
Social comparison and subjective norm	$\chi^2_{194} = 312.33$	62.98
Social comparison and self-identity	$\chi^2_{194} = 400.03$	150.68
Social norm and self-identity	$\chi^2_{194} = 326.16$	76.81

*Based on Gefen et al. (2003), the table shows that the χ^2 of the original CFA is significantly smaller than the CFA of any alternative model. Since combining two latent variables adds degrees of freedom to the model, the χ^2 of the original CFA should be greater than at least 23.04. As the table shows, all differences are above the threshold.

Appendix B. Item Correlation

Items	Mean	Std.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
SEID1	2.96	1.65	1																					
SEID2	3.12	1.58	0.72	1																				
SEID3	2.59	1.76	0.62	0.71	1																			
SEID4	3.21	1.57	0.62	0.66	0.65	1																		
A1	4.46	1.66	0.13	0.09	0.08	0.11	1																	
A2	4.23	1.48	0.30	0.18	0.19	0.27	0.45	1																
SP1	3.84	1.63	0.46	0.44	0.51	0.33	0.25	0.33	1															
SP2	4.51	1.33	0.31	0.27	0.36	0.30	0.24	0.33	0.61	1														
SP3	4.83	1.32	0.36	0.38	0.40	0.36	0.25	0.36	0.58	0.74	1													
SC1	3.46	1.69	0.45	0.33	0.34	0.33	0.11	0.26	0.29	0.25	0.27	1												
SC2	3.21	1.49	0.42	0.44	0.46	0.47	0.08	0.20	0.29	0.22	0.27	0.74	1											
SC3	3.36	1.71	0.37	0.30	0.31	0.27	0.10	0.24	0.27	0.21	0.19	0.77	0.76	1										
ESN2	3.59	1.36	0.43	0.45	0.35	0.41	0.11	0.38	0.36	0.25	0.35	0.48	0.48	0.50	1									
ESN3	3.64	1.36	0.45	0.48	0.33	0.47	0.21	0.36	0.41	0.33	0.41	0.46	0.48	0.52	0.73	1								
SATIS1	4.09	1.47	0.43	0.48	0.45	0.42	0.31	0.32	0.41	0.35	0.44	0.27	0.33	0.22	0.29	0.40	1							
SATIS2	3.86	1.61	0.47	0.50	0.50	0.43	0.22	0.30	0.39	0.32	0.46	0.37	0.41	0.38	0.32	0.38	0.77	1						
SATIS3	3.85	1.58	0.45	0.51	0.49	0.42	0.28	0.37	0.43	0.36	0.47	0.35	0.37	0.34	0.33	0.36	0.78	0.93	1					
SATIS4	3.76	1.52	0.41	0.47	0.49	0.38	0.33	0.40	0.43	0.29	0.46	0.34	0.39	0.33	0.26	0.37	0.71	0.77	0.81	1				
LOYAL1	3.90	1.32	0.32	0.41	0.33	0.28	0.20	0.33	0.40	0.30	0.41	0.29	0.40	0.33	0.34	0.39	0.58	0.67	0.66	0.61	1			
LOYAL2	3.65	1.34	0.42	0.52	0.50	0.36	0.15	0.31	0.43	0.30	0.41	0.38	0.38	0.36	0.36	0.39	0.57	0.71	0.73	0.69	0.79	1		
LOYAL3	3.41	1.90	0.55	0.54	0.58	0.46	0.28	0.36	0.49	0.36	0.46	0.44	0.45	0.43	0.34	0.42	0.64	0.77	0.76	0.67	0.49	0.63	1	
LOYAL4	3.35	1.57	0.42	0.46	0.47	0.40	0.11	0.33	0.33	0.24	0.32	0.48	0.47	0.48	0.49	0.51	0.47	0.68	0.63	0.60	0.54	0.65	0.65	1