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WHAT IF YOUR AVATAR LOOKS LIKE YOU? DUAL-CONGRUITY PERSPECTIVES FOR AVATAR USE[1]

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As broadband Internet access and virtual reality technology rapidly expand, virtual worlds and three-dimensional avatars will become more pervasive and widely adopted. In virtual worlds, people assume an identity as an avatar and interact with each other. The objective of this study is to theorize how users form attitudes and intentions regarding avatars in realistic, task-focused virtual world settings. To investigate these effects, this study proposes a conceptual framework based on dual-congruity perspectives (self-congruity and functional congruity). The results show that the more closely an avatar resembles its user, the more the user is likely to have positive attitudes (e.g., affection, connection, and passion) toward the avatar, and the better able to evaluate the quality and performance of apparel products. In the end, these positive attitudes toward an avatar and its usefulness positively affect users' intentions to use the avatar. Based on this study, we propose that avatars representing users' actual appearance may be helpful in experiencing and evaluating some business areas related to users' lives in the real world (e.g., virtual apparel shopping, matchmaking, plastic surgery, fitness clubs, etc.); utilization of such avatars may be a new business opportunity likely to thrive in virtual worlds.

Keywords: Virtual worlds, self-concept, self-congruity, functional congruity, avatar similarity, avatar identification

Introduction

The rapid growth of broadband Internet access and computing power has given birth to virtual worlds in which individuals take on an identity as an avatar, which is a general graphic representation personified by computer technology in a computer-simulated environment (Holzwarth et al. 2006). Virtual worlds have received a great deal of attention as alternative versions of the real world, causing organizations and individuals to increasingly cross into these computer-simulated environments. A virtual world is defined as "a computer-based simulated environment where individuals assume an identity as an avatar" (Jarvenppa et al. 2007) and a computer generated display allows or compels users to have a sense of being present in an environment other than the one they are actually in and also to interact with that environment via avatars (Schroeder 1996). Thus, the most distinctive feature in virtual worlds is that individuals are present in the form of an avatar through which they interact with other individuals represented by other avatars and with objects (e.g., products) and the environment (Jordan 1999).

Numerous studies have focused on the role of an avatar in non-task–focused contexts such as social network services (Cui et al. 2009; Jordan 1999; Kang and Yang 2006). However, as the boundary blurs between the virtual and the real

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The appendices for this paper are located in the "Online Supplements" section of the *MIS Quarterly*'s website (http://www.misq.org).

worlds, significant interest has arisen in the use of virtual world technologies in realistic, task-focused contexts such as training, interactive information presentation, and shopping (Bourlakis et al. 2009; Vitzthum and Hussmann 2006). For example, the Wii Fit[2] has been applied in hospitals and rehabilitation centers to train patients, and some scholars have studied the effect of the Wii Fit on rehabilitation and public health. In the medical field, training in surgical techniques such as suturing have become possible within virtual contexts and improved the reliability and safety of surgical procedures and also made them faster (Berkley et al. 2004; Lannon et al. 2001; Rabi and Aarabi 2006; Reilly 2008). Moreover, several apparel companies (e.g., Browzwear, OptiTex, Lectra Systems, Gerber Technology, Tukatech, and My Virtual Model) use virtual world technology to allow shoppers to check the fit and appearance of garments on simulated bodies that have the customer's own measurements (Loker et al. 2005).

In these realistic, task-focused virtual contexts, the degree of realism of the simulation is the important factor in determining how well tasks are performed (Herring et al. 2003). Accordingly, the properties of the avatars used in a realistic, task-focused virtual context seem to be critical to task performance and to the motivation of users to continue to use the avatars in similar contexts. In these realistic, task-focused virtual contexts, users seem to behave according to their perception of the identity they have established through their avatar (Sirgy 1986). In virtual worlds, people who interact through avatars that resemble themselves are likely to focus more closely on a task and to be motivated to perform it better (Cui et al. 2009; Galanxhi and Nah 2007).

The goal of this study is to theorize how users form attitudes and intentions regarding the use of avatars in realistic, task-focused virtual world settings. In pursuit of this goal, we adopted dual-congruity perspectives that help us understand the influence an avatar that does or does not resemble the user's self has on the user's cognitive connection with it—called *self-congruity*—and with the functional attributes the user desires—called *functional congruity*. Specifically, we examined the influence of an avatar's appearance on intention to use the avatar. At the same time, we also took into consideration the mediating roles of avatar identification, emotional attachment, and perceived diagnosticity based on self-congruity and functional congruity perspectives.

[2]Wii Fit is a video game developed by Nintendo for the Wii console. It is an exercise game consisting of activities using the Wii Balance Board peripheral. Wii Fit is the second best selling video game in history, with 22.56 million copies sold as of December 30, 2009 (http://en.wikipedia.org/wiki/Wii_Fit).

In the next section, we will review previous studies on avatars, self-congruity, and functional congruity in the course of building a theoretical foundation for our research model. In the third section, we present our research model and hypotheses. We then explain the research method, including operationalization of independent variables, design of the virtual store, participants, experimental procedure, and measurement items. Data analysis and results are presented in the subsequent section. Finally, we conclude with key insights and implications for theory and practice and suggest future research.

Theoretical Background

Avatars

Avatars have been studied extensively within the IS discipline as the characteristics of a person and those of a product or a tool (Cui et al. 2009; Jordan 1999; Kang and Yang 2006). Some scholars have viewed an avatar as "another self in the virtual world" with the characteristics of a person (Bailenson and Yee 2005; Balsamo 2000; Jordan 1999; Kafai et al. 2007; Kang and Yang 2006; Yee et al. 2007). They have focused on the value expressive attributes of avatars and how people express their values and characteristics through avatars in non-task–focused contexts such as social networks. According to these researchers, people express their own values by choosing avatars related to themselves and by decorating them (Kang and Yang 2006; O'Brien and Murnane 2009). On the other hand, some other researchers have viewed an avatar as "a product or a tool" (Cui et al. 2009; Galanxhi and Nah 2007; Loker et al. 2005). They have focused on the utilitarian attributes of avatars and how people use them to support various work in realistic, task-focused contexts such as training and shopping. Within fitness and weight loss monitoring contexts, for example, people are motivated and kept focused on healthy practices by creating and keeping track of their avatars (Fox and Bailenson 2009). In the context of shopping, customers are able to choose more suitable clothes for themselves, even in virtual worlds, by using their own avatars to try on items of apparel (Loker et al. 2005).

Most of the aforementioned studies have examined avatars by focusing mainly on either the characteristics of a person or those of a product or tool. However, we contend that by focusing on both aspects, we can obtain a richer understanding of the phenomena, because both characteristics coexist in avatars used in realistic, task-focused environments. For example, in shopping and training, people use avatars not merely from a utilitarian perspective (choosing suitable clothes and exercising) but also from the perspective of expressing values (showing the person's appearance, body

shape, and movements) and sharing these value characteristics with others such as friends and coaches (Cui et al. 2009). Moreover, according to previous studies, utilitarian perspectives also are influenced by value expressive perspectives (Sirgy and Danes 1982; Sirgy et al. 1991). Hence, if we focus on only one perspective, we cannot discern the effect of the other perspective and risk undermining the effect avatars' attributes may have on tasks performed in virtual worlds. Consequently, because both value expressive and utilitarian perspectives must be considered in realistic, task-focused virtual contexts, we have applied both perspectives in terms of dual-congruity.

Dual-Congruity Perspectives

Johar and Sirgy (1991) asserted that value expressive and utilitarian attributes operate through two different psychological processes—self-congruity and functional congruity, respectively—to influence an individual's attitudes and behaviors. Self-congruity is a psychological process in which an individual focuses on source images and matches these to his or her self-concept. On the other hand, functional congruity is the match between the beliefs in the utilitarian attributes of a product or service and an individual's criteria. The greater the increase in self-congruity and functional congruity, the greater the increase in the generation of positive attitudes and behaviors (Johar and Sirgy 1991). The crux of the dual-congruity approach is that people may generate their attitudes and behaviors through two different processes. In other words, different people may prefer the same products or services for quite different reasons, one because of expressive attributes and the other for utilitarian reasons. Thus, to better understand one's attitude and behavior may require two different perspectives, and through this approach we may suggest how to improve a product or service to generate better attitudes and behaviors toward the product or service. This study employs dual-congruity perspectives to examine, from both value expressive and utilitarian appeals, how users form attitudes and intentions regarding avatars in realistic, task-focused virtual world settings. Value expressive attributes are investigated according to the self-congruity perspective, and utilitarian attributes are scrutinized according to the functional congruity perspective.

Self-Congruity Perspective

Self-concept[3] has been researched in various disciplines such as psychology, advertising, and organizational and consumer behavior as an important factor in explaining human attitudes and behaviors toward an external object (Sirgy 1986). Self-concept is defined as "the totality of the individual's thoughts and feelings having reference to himself as an object" (Rosenberg 1979, p. 7). More simply, it is an individual's subjective, rather than objective, thoughts and perceptions about himself or herself (Mehta 1999).

The effects of self-concept on human attitudes and behaviors have been explained by self-consistency motivation (Epstein 1980; Lecky 1945).[4] Self-consistency motivation denotes the disposition to behave consistently with one's perception of oneself and also to seek experience that maintains this self-concept. This self-consistency motivation provides a foundation for examination of such human attitudes and behaviors as choices of products or brands and loyalty to persons or organizations (Jones 1973; Schalenker 1975; Schrauger and Lund 1975).

Many consumer studies have demonstrated the existence of a relationship between self-concept and product-concept and emphasized the importance of self-congruity through self-consistency motivation (Ericksen and Sirgy 1989, 1992; Malhorta 1981, 1988; Sirgy 1985; Sirgy et al. 2000; Sirgy and Su 2000). Consumer psychologists argue that a product or brand has its own image or concept in a manner similar to self-concept and that such a product or brand is an important part of how consumers define themselves. This perception and symbolic meaning of a product is called product-image or product-concept (Sirgy 1986). Thus, consumers would like to maintain their self-concept (because of self-consistency motivation) through the consumption of products, and they communicate these desires to others through the symbolic meaning of a product (Grubb and Granthwhohl 1967).

Sirgy (1986) developed a self-congruity theory that explained the effect on consumer attitudes and behaviors of congruity between self-concept and product-concept. He insisted that high self-congruity occurs when self-concept and product-concept are similar; high self-congruity leads to positive con-

[3]Self-concept consists of multidimensional perspectives and various conceptualizations. Among these perspectives, *actual* and *ideal* self-concepts have been widely used in consumer research (Burns 1979; Rosenberg 1979). Actual self-concept refers to how a person perceives himself or herself regardless of his or her desire; ideal self-concept refers to how a person desires to perceive himself or herself (Sirgy 1982). In this study, we only consider actual self-concept because ideal self-concept is not directly related to our research context.

[4]The effects of self-concept have been explained by two different motivations: self-esteem and self-consistency motivation (Epstein 1980; Jones 1973; Schalenker 1975; Schrauger and Lund 1975). In this study, we only consider self-consistency motivation because self-esteem motivation has been applied to explain the effects of ideal self-concept.

sumer attitudes and behaviors by satisfying self-consistency motivation. In contrast, when self-concept and product-concept are mismatched, self-congruity is low, which leads to negative consumer reactions because of dissatisfaction with self-consistency motivation (Sirgy 1986).

Consequently, according to self-congruity theory, people want to purchase and use products that are congruent with their self-concept in order to maintain their self-concept.

In social psychology studies, many scholars have applied the concept of self-congruity under the rubric of identification because identification is a direct consequence of self-congruity that exists as a psychological state of mind (Magin et al. 2003). For instance, many consumer studies report that people tend to identify with others whose characteristics are congruent with their self-concept (Magin et al. 2003; Siegel and Sisaye 1997). According to these studies, a person's self-concept is affected by a person or a group with which he or she identifies; this occurs because people have a need to define themselves (e.g., who am I?) and are motivated to maintain their self-concept by internalizing the characteristics of other people or categorizing themselves as part of a group (Ashforth and Mael 1989; Hodson et al. 2003; Tajfel and Turner 1979). This perceptual cognition of identifying with other people or a group is called *identification* (Ashforth and Mael 1989).

Generally, identification refers to a situation in which a person may "attempt to be like or actually to be the other person" (Kelman 1958, p. 53), and it is predicated on the desire to appease, emulate, or vicariously gain the qualities of the other in order to define and maintain a person's own identity (Bandura and Walters 1963; Kets de Vries and Miller 1984). The concept of identification has been adapted to the investigation of human attitudes and behaviors toward a person (e.g., media characters, organization leaders, or game characters) (Avolio et al. 2004; Bhattacharya et al. 1995; Bhattacharya and Sen 2003; Hefner et al. 2007; Liebes 1996; Shamir et al. 1993). Thus, identification is an important construct in explaining people's attitudes and behaviors toward a person or a group that these people have found useful for maintenance of their self-concept.

Functional Congruity Perspective

Although the self-congruity perspectives are useful in interpreting human attitudes and behaviors, these perspectives, because the utilitarian aspect is ignored, have limits in their capability to aid understanding of how people evaluate external objects. To overcome this limitation, Samli and Sirgy (1981) developed the concept of functional congruity based on utilitarian aspects, which is the similarity between a product's functional attributes and the consumer's desired functional attributes. Their study showed a biasing effect of self-congruity on functional congruity. This suggests that although functional congruity is more closely related to behavior than is self-congruity, functional congruity is highly affected by self-congruity. According to Sirgy et al. (1991, p. 365), this result is owed to

> the notion that self-congruity involves abstract cognitive schemes which become activated and processed at a less conscious level, which is followed by a decompositional process in which specific functional attributes of the product/store are generated and consequently evaluated.

Markus (1980) insisted that self-concept, which is the personality image associated with the individual self (self-perception), and the personality image associated with "others" (person perception) are all cognitive schemes organized at a higher level in the cognitive hierarchy. Cognitive schemes high in this hierarchy are referred to as abstract schemes, and those that are low in the same hierarchy are referred to as concrete schemes. Abstract schemes, consisting of a number of particularized concrete schemes, can be more accessible and more easily activated because, in the process of cognition, several concrete schemes are replaced with an abstract schema when a process of generalization is required. Therefore, when an abstract schema is activated, it can be subjected to a decompositional process in which more concrete schemes are generated from the abstract schema (Abelson 1976; Anderson 1980; Neisser 1976; Wyer and Carlson 1979).

Moreover, within this decompositional process, abstract schemes are able to affect the direction of more concrete schemes. In the social cognition literature (for a literature review, see Nisbett and Ross, 1980), this has been referred as the *self-serving bias* in information processing. The underlying notion in this principle is that people first process self-related information to determine the self-consistency properties of the information, the outcome of which guides further processing related to non-self information, because people are more motivated to form beliefs that maintain the self (Sirgy et al. 1991). In a consumer context, for example, a consumer's information processing of the functional (concrete) attributes of a product is affected by a motivational tendency (positive or negative) developed through information processing of self-related (abstract) attributes.

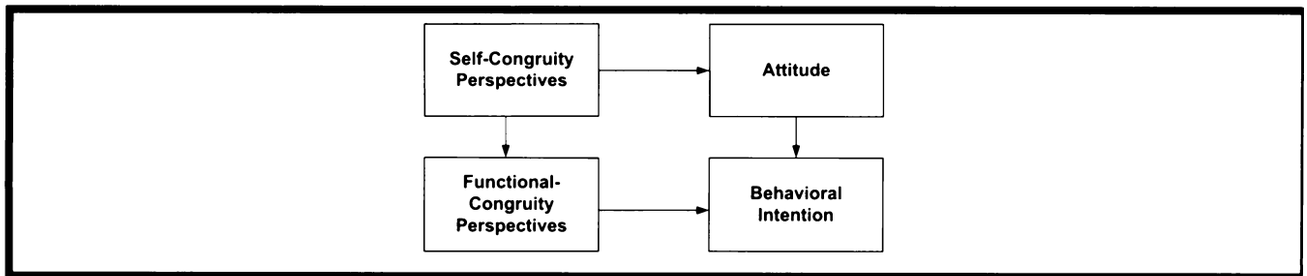


Figure 1. Dual-Congruity Model of Avatar Use in Realistic, Task-Focused Virtual Worlds

Consequently, self-congruity involves abstract cognitive schemes activated and processed at a less-conscious level. This is then followed by a decompositional process in which specific functional attributes, concrete schemes, are generated and evaluated. This evaluation, influenced by a self-consistency motivation developed as a result of self-congruity, in turn influences consumer behavior.

Based on the literature from these disciplines, we developed a dual-congruity model (see Figure 1) to examine users' attitudes, evaluations, and behavioral intentions toward an avatar in realistic, task-focused virtual worlds.

Research Model and Hypotheses

In accordance with the conceptual framework, we developed a research model to examine the effect on usage and usefulness of an avatar that resembles the user as much as possible (see Figure 2).

Avatar Similarity

Although self-concept has been considered an important factor in explaining human attitudes and behaviors, only a few studies have examined what characteristics constitute self-concept. Morin (2004) suggested that self-information may build a self-concept. By focusing on oneself, it is possible to become a reflective observer, processing self-information. For example, a person can get very close to a mirror and examine a specific physical aspect (e.g., facial appearance and body shape) and become aware of this self-information. Self-information is made up of two different types of self-information: private and public. Private self-information consists of externally unobservable events and characteristics (e.g., emotions, physiological sensations, values, goals, etc.), and is represented conceptually. In contrast, public self-information is made up of observable characteristics (e.g., behavior and physical appearance), represented perceptually (Morin 2006).

According to Morin's studies, we use public self-information in constituting self-concept. Thus, in virtual worlds, if an individual perceives that an avatar's physical appearance (face and body) resembles his or her actual physical appearance, the avatar can be considered to sufficiently reflect the user's self-concept. Accordingly, we defined *avatar similarity* as the perceived similarity between the avatar's physical appearance and the user's physical appearance; the extent of an avatar's similarity is regarded as the degree of reflection of self-concept. In addition, to investigate the usefulness of avatar similarity for a realistic task, especially a task such as apparel shopping, we divided avatar similarity into facial similarity and body similarity. This division was made because it is possible that the usefulness of facial and body similarity may differ in a virtual apparel store.

Avatar Identification

Because people build identity in association with an avatar and because an avatar has been considered another self in the virtual world that has a personality like a human (Jordan 1999; Kafai et al. 2007), we expect that in realistic, task-focused virtual contexts an avatar that looks much like the user will influence the usage and usefulness of the avatar because of the user's cognitive connection with it. This concept of cognitive connection is analogous to the meaning of identification, which is defined as a perceptual cognitive connection through identifying with other people (Ashforth and Mael 1989; Dutton and Dukerich 1994). In addition, Hefner et al. (2007) emphasized identification in a computer-mediated circumstance and defined it as "the 'feeling like' or the illusion to 'become' a person within a computer game's universe" (p. 39). Thus, we define avatar identification as the cognitive connection between an individual and an avatar, with the result being that the individual regards the avatar as a substitute self or has such an illusion.

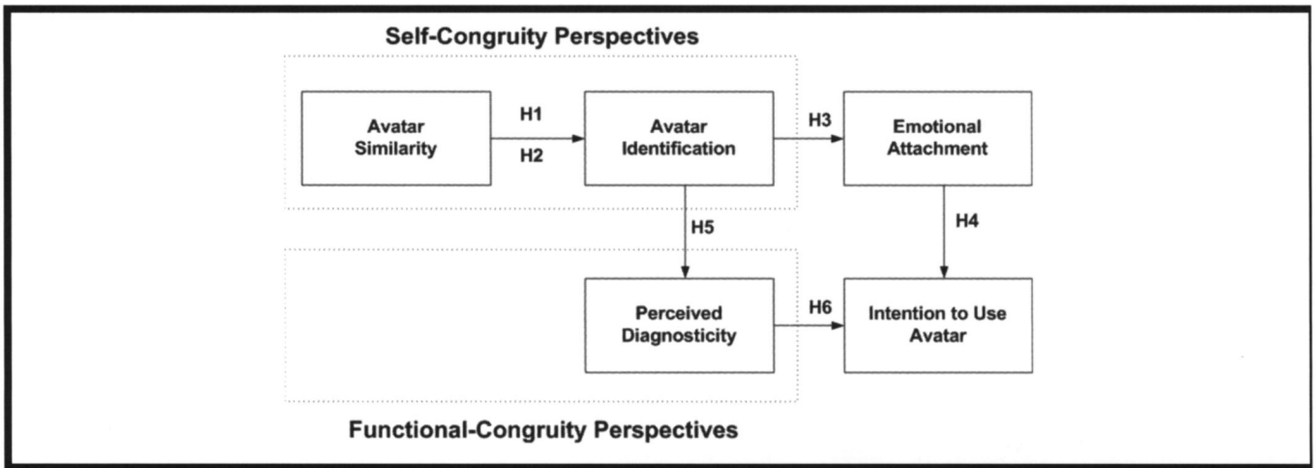


Figure 2. Research Model

In accordance with the concept of self-congruity, avatar similarity is expected to positively influence avatar identification because of self-consistency motivation. A person perceives self-congruity when an avatar's physical appearance is similar to his or her physical appearance. This self-congruity will positively influence avatar identification because people have a need to define themselves and are motivated to maintain a stable and consistent self-concept by using the characteristics of their avatars, especially physical appearance (Ashforth and Mael 1989; Kark and Shamir 2002; Kark et al. 2003; Shamir et al. 1993; Sirgy 1986). Thus, we hypothesize that

H1: *Facial similarity is positively related to avatar identification.*

H2: *Body similarity is positively related to avatar identification.*

Emotional Attachment

According to the studies in consumer and social psychology research, identification affects human behavior (e.g., loyalty, intention to use, and the willingness to pay a premium price) through emotional attachment (Bowlby 1979; Thomson et al. 2005). In studies of consumer behavior, the hierarchical models (Lavidge and Steiner 1961; Rogers 1962; Strong 1925) assert that the process of consumer decision making is sequential, beginning with perception, proceeding through affect, and concluding with "intention to" behavior. In virtual worlds, consumers first cognitively perceive an avatar's similarity and identification and next form an attitude toward the avatar such as one of emotional attachment, which in turn leads to use of the avatar. Thomson et al. (2005, p. 77) defined emotional attachment as "an emotion-laden, target-specific bond between a person and a specific object." This is a person's affection for a specific object connected with him or her such as pets, gifts, or a brand. Because of this sense of a bond or connection, emotional attachment has been considered an appropriate construct to use in the investigation of the effects of identification because identification is associated with a sense of connection with an object. For example, in social psychology and studies of consumer behavior, self-congruity and identification were the most important factors in the formation of emotional attachment, which predicts commitment (loyalty, intention to use, and willingness to pay a premium price) to an object (Bowlby 1979; Choi et al. 2007; Thomson et al. 2005). Thus, we hypothesize that

H3: *Avatar identification is positively related to emotional attachment.*

H4: *Emotional attachment is positively related to intention to use an avatar.*

Perceived Diagnosticity

In non-store shopping, the inability to touch and feel products makes it difficult for people to evaluate product quality. This lack of product information before making a purchase has been considered an obstacle to consumers' decision making because it increases perceived risk (Loker et al. 2005; Taylor 1974). Many information systems studies (Goodhue and

Thompson 1995; Jiang and Benbasat 2004; Suh and Lee 2005) have examined the effect of virtual reality (VR) technology on this problem in accordance with a task–technology fit. They argue that how well a task is performed is influenced by the degree of correspondence between task requirements and the functionality of the technology. To examine the usefulness of VR technology in the evaluation of product attributes, Jiang and Benbasat (2004, 2007) applied perceived diagnosticity, which is defined as the ability of an application to convey relevant product information for evaluation of quality and performance; they also examined whether perceived diagnosticity positively influences intention to purchase.

We used this construct to investigate the utilitarian aspects of avatars in terms of functional congruity, which is the usefulness of an avatar in representing the self-concept in realistic, task-focused virtual contexts. As mentioned earlier in the "Theoretical Background" section, when avatar identification (an abstract scheme high in the cognitive hierarchy) is activated, perceived diagnosticity (a concrete scheme low in this hierarchy) is influenced through a decompositional process in which specific functional attributes are evaluated. The overall evaluation, in turn, influences a user's intention to use the avatar because it decreases the perceived risk of the task (Loker et al. 2005; Taylor 1974). Thus, we hypothesize that

H5: *Avatar identification is positively related to perceived diagnosticity.*

H6: *Perceived diagnosticity is positively related to intention to use an avatar.*

Research Methods

This study was conducted within the context of a virtual apparel store for three reasons. First, we consider such stores to be places where realistic, task-focused virtual contexts already are being used to solve a real problem; second, an avatar representing a user's actual appearance has special value in such situations; and, third, the theorized aspect of the dual-congruity model might matter. A laboratory experiment was used to empirically test the effects of avatar similarity on avatar usage. A 2 × 2 factorial design with two between-subject factors was used. The factors, facial similarity and body similarity, had two levels: high similarity and low similarity. To eliminate any potential extraneous effects in the experiment, participants were assigned randomly to each condition (see Table 1). To enhance mundane realism, shape the similarity of experimental events to real experience (Singleton and Straits 1999), and ensure the generalizability of the findings, we selected products sold in apparel stores and chose interfaces developed by a commercial VR application provider.

Independent Variables: Facial Similarity and Body Similarity

To differentiate avatar facial similarity, we adopted two methods of avatar face generation.

The first method was a three-dimensional (3D) face scan. Because a 3D scanner has the ability to duplicate the precise shape of an object, it was useful in generating an avatar face that closely resembled a participant's. We scanned the participant's face and took high resolution digital pictures to get the precise facial shape and image. By applying high resolution digital pictures to the 3D rendering of facial shape, we were able to generate, as shown in Appendix A, an avatar face with a closer resemblance to the participant.

Another method used was to choose one face from among four generic faces. All the faces had been generated to have various hairstyles and facial shapes as shown in Appendix B. Before the main experiment, participants were asked to choose a generic face that was most similar to their own. This face generation method has been adopted in many commercial virtual stores and in online role-playing games. Although a generic avatar face was chosen by participants based on its similarity to theirs, the avatar face generated by the facial scan would be a much closer resemblance. Thus, the second method seemed appropriate for generating a less similar avatar face.

Similarly, two different methods of avatar body generation, a body scan and body mass index (BMI), were used to manipulate the level of body similarity. The body scanner provided accurate information regarding the surface of the human body so as to improve the similarity of the avatar body. Thus, the avatars of the high-body similarity group were generated by 3D scan data as shown in Appendix C. Although a body scan was the most precise way to generate an avatar with a similar body, this method had a number of limitations (such as the high price of a body scanner, cumbersome scanning procedure, etc.). Accordingly, VR application providers have been trying to develop an alternative method. Of these methods, the most typical one is BMI, which generates an avatar based on standard height and weight. Participants were asked to describe their height, weight, and age, and to choose from those available the body shape most similar to theirs. (Men

Table 1. Experimental Design

		Facial Similarity	
		High	Low
Body Similarity	High	Group 1 (23)	Group 2 (23)
	Low	Group 3 (23)	Group 4 (23)

Note: 92 subjects were randomly assigned into the four groups.

could choose from among four shapes and women from six.) The BMI module was designed to allow participants to choose a body shape most similar to theirs from among 100 stored in the database, and this body was then adjusted based on an individual's specific body information. This method has been used in various ways and adopted commercially. Thus, we adapted the BMI method to use with the low-body similarity group (see Appendix C).

A manipulation check for perceived facial similarity and body similarity was conducted. At the end of the experiment, after participants chose the most suitable apparel, they completed questionnaires to rate their level of agreement with the facial and body similarity of the avatar used (see Table 2). The manipulation was successful. On average, the 92 participants perceived that the two methods of face generation had different levels of similarity: a high similarity face ($M = 4.33$, $SD = 1.40$) versus a low similarity face ($M = 2.68$, $SD = 1.19$, $t(90) = 6.071$, $p < 0.01$), and the similarity scores provided by the high-body similarity group ($M = 5.46$, $SD = 1.17$) differed statistically from the low-body similarity group ($M = 4.38$, $SD = 1.37$, $t(90) = 4.052$, $p < 0.01$).

Virtual Store Design

We constructed a virtual store and chose apparel (shirts and jeans) for the experiment. We chose shirts and jeans because students of both sexes and all ages commonly wear them, and apparel fit is important in purchasing both garments. In keeping with research objectives and mundane realism, we prepared three and four sizes, respectively, of shirts and jeans. In addition, to prevent extraneous effects such as participants' preference for a specific color or type, we provided only one type of shirts and jeans for participants.

The store was developed in collaboration with a commercial VR application provider. It was developed using HTML and JavaScript, both commonly used, and the quality and functions of the store were adequate to accomplish the research objectives. In the store, participants were able to select various sizes of apparel and identify apparel information (such as material, features, and visual images). When participants chose a specific size, they were able to try it on their avatar and to zoom their avatar in/out at different angles. In addition, they were able to use various functions to evaluate apparel fit. For example, a silhouette function showed the apparel translucently and permitted examination of the distance between the avatar's body and the apparel, and an ease function reported apparel fit information about each part of the body by calculating the distance between the body and the apparel. Appendix D provides examples of the virtual store.

The virtual store was saved on a commercial Web server that participants accessed through the Internet with a T1 connection. IBM 1.86 GHz Pentium PCs with 2 gigabytes DDR SDRAM, 19-inch color LCD monitors, and the GeForce 7300, a VR supporting graphic card, were used for the experiment. Participants browsed the Internet using Microsoft Internet Explorer (Version 7.0). With this configuration, retrieval of information, including VR representations, was realistic.

Experimental Procedure

Participants

A total of 107 participants were assembled from economics and management courses in a large university, 102 of whom were undergraduate students and 5 were graduate students. Participation was voluntary; all participants were offered a monetary reward ($20) to encourage their participation in the experiment. To further motivate the participants to view the experiment as a serious online shopping session, they were told before the experiment that one participant, selected by a random drawing, would receive a $1,000 laptop computer. Of the 107 participants, 5 graduate students and 10 undergraduate students participated in a pretest, and 92 students participated in the main experiment. The participants in the main experiment averaged 24 years of age; 48 were male and 44 were female. In point of fact, most current users of virtual

Table 2. Construct and Measurement Items

Construct	Measurement Item	Loading
Facial Similarity (Developed)	(FS1) This avatar face is similar to my face	0.97
	(FS2) I think that my face and this avatar face resemble each other in appearance	0.97
Body Similarity (Developed)	(BS1) This avatar body is similar to my body	0.98
	(BS2) I think that my body and this avatar body resemble each other in appearance	0.98
Avatar Identification (Bhattacharya et al. 1995)	(AI1) When someone criticizes this avatar, it feels like a personal insult	0.80
	(AI2) I am very interested in what others think about this avatar	0.60
	(AI3) When I talk about this avatar, I usually say I rather than that	0.71
	(AI4) When someone praises this avatar, it feels like a personal compliment	0.85
Emotional Attachment (Thomson et al. 2005).	Describe the extent to which the following words describe your typical feelings toward this avatar	
	(EAA1) affectionate	0.86
	(EAA2) lovely	0.90
	(EAA3) peaceful	0.90
	(EAA4) friendly	0.82
	(EAC1) attached	0.89
	(EAC2) bonded	0.93
	(EAC3) connected	0.82
	(ECP1) passionate	0.92
	(ECP2) delighted	0.93
	(ECP3) captivated	0.84
Perceived Diagnosticity (Jiang and Benbasat 2007)	(PD1) This avatar is helpful for me to evaluate the fit between myself and the product	0.90
	(PD2) This avatar is helpful in familiarizing me with the product	0.87
	(PD3) This avatar is helpful for me to understand the difference in fit among different sizes of this product	0.88
Intention to Use Avatar (Venkatesh et al. 2003)	(IUA1) I intend to use this avatar in the near future	0.94
	(IUA2) I predict I would use this avatar in the near future	0.94
	(IUA3) I plan to use this avatar in the near future	0.96
Self-Satisfaction (Newton and Minhas 2005)	(SS1) How do you feel about the appearance of your face? (Strongly dissatisfied/satisfied)	0.75
	(SS2) How do you feel about the appearance of your body? (Strongly dissatisfied/satisfied)	0.94
Negative Reaction to Scanning (Diener et al. 1995)	Describe the extent to which the following words describe your typical feelings when being scanned	
	(NRS1) shame	0.95
	(NRS2) sadness	0.91
	(NRS3) anger	0.85
Perceived Ease of Use (Pavlou and Fygenson 2006)	(PEU1) Purchasing this product from this website would be *easy*: (Extremely unlikely/likely)	0.52
	(PEU2) For me, purchasing this product *easily* from a Web vendor is (Not at all /Extremely important)	0.49
	(PEU3) Learning how to purchase this product from this Web vendor would be *easy*: (Strongly disagree/agree)	0.98
	(PEU4) For me, learning how to purchase this product *easily* from a Web vendor is: (Not at all /Extremely important)	0.98
Shopping Experience (Pavlou and Fygenson 2006)	(SE1) During the last year, how many times have you made product purchases from the Internet *in general*?	n/a
	(SE2) During the last year, how much have you approximately spent on Internet purchases?	n/a
	(SE3) During the last year, how many times have you made apparel purchases from the Internet *in general*?	n/a
	(SE4) During the last year, how much have you approximately spent on Internet apparel purchases?	n/a

Note 1: All measurement items (except for self-satisfaction, shopping experience, and perceived ease of use) are 7-point scales with anchors 1 = strongly disagree and 7 = strongly agree.

Note 2: Emotional attachment is a reflective second-order construct consisting of three first-order factors (affection, connection, and passion).

worlds are older than 30 (e.g., Second Life). However, the 20–30 age group offers tremendous potential for virtual worlds because of their affinity for social networks, online gaming, and online shopping (Fox 2005; Virtual Worlds News 2008). Thus, the present study concentrates on young adults, mostly college students, because of their potential to become heavy users of virtual shopping. Of the participants, 97 percent had experience with online shopping, and 76 percent had experience with online apparel shopping. On average, they had purchased six apparel items for $232 in online stores within one year (see Table 3). A chi-square analysis revealed no significant differences in gender and previous online apparel shopping experience among the groups. A one-way analysis of variance (ANOVA) further revealed no significant differences between the groups in terms of age, number of years in the university, and the frequency and amount of online apparel shopping.

Experimental Procedure

The scanning procedure was complex and time consuming because the laboratory housing the scanning equipment was away from the university and also because participants were required to change into a swimsuit. Because the scanning experience required considerable time and effort of the participants, if only some participants were scanned, there could be a systematic bias between those who were scanned and those who were not. On the other hand, if all of the participants were scanned, but some never saw their scanned body, they could become confused, and this expectation–disconfirmation could cause systematic bias as well. To settle this conflict, we first scanned all the participants' faces and bodies. Second, to prevent expectation–disconfirmation, we announced before the main experiment that the avatar would be presented twice, and one of these was generated based on scan data. In the main experiment, participants examined the avatar assigned to their group the first time; after shopping, they were required to complete the main questionnaire. After the main experiment, all the participants examined a high similarity (face and body) avatar in a placebo experiment session. This procedure prevented the systematic bias that could occur from a different scanning experience and from expectation–disconfirmation.

The face and body scanning was conducted at the laboratory of the VR application provider. Participants visited the laboratory individually. After the scanning process, participants were asked to complete a questionnaire regarding body information for BMI (height, weight, age, body shape, and generic face), negative reaction to scanning, and self-satisfaction. It took about 30 minutes to complete the scanning process and fill out the questionnaire.

The main experiment was not conducted immediately after the scanning because it took at least an hour to generate each participant's avatar. The experiment was scheduled for about one week (from five to nine days) after scanning to control the interval between scanning and the main experiment. The difference in the interval between experimental groups was not statistically different.

In the main experiment, participants read an information sheet and completed a consent form. Next, they received 10 minutes of training on VR interfaces. The tutorial material was presented by the same instructor so as to ensure identical training. After confirming that all the participants fully understood how to manipulate the interfaces, they were asked to start the main session. Each participant used an avatar and VR interfaces to choose the most appropriate apparel. Participants were allowed to take as much time as needed. Most participants spent between 11 and 44 minutes, with an average session time of 24 minutes. After shopping, each participant was asked to complete the main questionnaire, including manipulation check questions about avatar similarity. Next, participants continued on to participate in a placebo experiment session.

Measurement Items

The measurement items are listed in Table 2, along with their sources. This study developed new measures for avatar similarity by adopting a three-step method (Moore and Benbasat 1991) and used validated scales, with minor word changes, for all mediating and dependent variables. These measures have been commonly used to assess each variable and seem to be appropriate for this experimental context. The measures for avatar identification were adopted from Bhattacharya et al. (1995). Of the six items Bhattacharya et al. selected, "the museum's successes are my successes" and "if a story in the media criticized the museum, I would feel embarrassed" were removed because these items were not appropriate for our experimental context. The measures for emotional attachment were adopted from Thomson et al. (2005), which is a reflective second-order construct consisting of three first-order factors (affection, connection, and passion). The measures for perceived diagnosticity were adopted from Jiang and Benbasat (2004), and the measures for intention to use an avatar, which means participants' willingness to use the avatar to shop for apparel, were adopted from Venkatesh et al. (2003).

To rigorously examine the effect of avatar similarity, we controlled three constructs (i.e., negative reaction to scanning, self-satisfaction, and perceived ease of use) that could affect the result. In studies of interpersonal relationships, many scholars have investigated the effects of extrinsic and intrinsic

Table 3. Participants' Characteristics

	Mean	Standard Deviation
Age	23.74 years	1.53 years
Gender	Male	48
	Female	44
Have purchased online?	Yes	89
	No	3
Purchases online during the last year	14.37	18.11
Money spent online during the last year	$686.60	$1234.52
Purchased apparel in Web-based store during the last year	Yes	70
	No	22
Online apparel purchases during the last year	6.24	12.55
Money spent on Internet apparel purchases during the last year	$232.59	$340.30

Note 1: Sample size = 92. No missing data.

investment on cognition and attitudes (Garbarino and Johnson 1999; Moon and Bonney 2007; Rusbult 1980, 1983). These scholars have insisted that psychological attachment, identification, and loyalty are a function of emotional effort, which is a component of intrinsic investment. In addition, Sirgy (1986) argued that a person's attitude toward self-concept could influence the effects of self-congruity. He divided self-congruity into positive self-congruity and negative self-congruity according to a difference in attitude toward self-concept (i.e., positive and negative attitudes), and he suggested that the influence of self-consistency motivations could differ depending on the attitude toward self-concept. According to the technology acceptance model (TAM), moreover, ease of use is one of the most important factors in determining intention to use an information system. Thus, to eliminate their potential impact on the result, we have controlled for the effect of emotional effort (negative reaction to scanning), attitude toward self-concept (self-satisfaction) on avatar identification, and emotional attachment by adopting measures from Newton and Minhas (2005) and Diener et al. (1995). Similarly, we have adopted measures from Pavlou and Fygenson (2006) to control for the effect of perceived ease of use on intention to use an avatar.

All measurement items are seven-point Likert scale (1 = strongly disagree; 7 = strongly agree). The validity and reliability of measurement items were tested when they were used in the main experiment. The results of validity and reliability tests will be explained in the next section.

Data Analysis and Results

We chose the partial least squares (PLS) structural equation as the main statistical technique. PLS is widely accepted as a method for testing theory in its early stages and requires a small sample size (Chin 1998; Fornell and Bookstein 1982). PLS-Graph Version 3.0 software (Chin and Frye 1994) was used for the data analysis.

A PLS model is analyzed and interpreted in two stages: the assessment of the measurement model (reliability and validity of the measurement) and the assessment of the structural model. The manipulation check scores for independent variables, which are the participants' perceptions of avatar similarity affected by the treatment, were used in the model.

Measurement Model

The first step in validating the measurement model was to assess reliability, convergent validity, and discriminant validity. Table 4 shows the descriptive statistics and composite reliability of the constructs. All composite reliabilities were greater than 0.7, the recommended cutoff (Barclay et al. 1995; Fornell and Larcker 1981). Thus, the reliability of the measurements seemed acceptable.

Convergent validity is the extent of the relatedness of items that theoretically should be related. Convergent validity is assessed by individual item reliability, the composite reliability of the construct, average variance extracted (AVE) (Barclay et al. 1995; Hu et al. 2004), and factor analysis results. Individual item reliability was assessed by examining the loadings of the measurement items on their corresponding construct, and all the item loadings should be significant and exceed 0.7. Although all measurement items were significant at $p < 0.001$, Item 2 of avatar identification and items 1 and 2 of perceived ease of use (i.e., AI 2, PEU1, and PEU2) showed low factor loadings (see Table 2) and were excluded from

Table 4. Descriptive Statistics and Composite Reliability of Constructs

Constructs		Mean	Standard Deviation	Composite Reliability
Facial Similarity (FS)		3.50	1.57	0.97
Body Similarity (BS)		4.91	1.40	0.98
Avatar Identification (AI)		4.43	1.66	0.85
Emotional Attachment (EA)	Affection (EAA)	4.04	1.45	0.93
	Connection (EAC)	3.21	1.50	0.91
	Passion (EAP)	3.47	1.49	0.93
Perceived Diagnosticity (PD)		5.25	1.32	0.91
Intention to Use Avatar (IUA)		5.21	1.37	0.96
Self-Satisfaction (SS)		4.22	1.22	0.85
Negative reaction to Scanning (NRS)		2.54	1.50	0.93
Perceived Ease of Use (PEU)		6.15	1.05	0.98

further analysis. As shown in Table 5, all the composite reliability values exceeded 0.7, the recommended criterion (Barclay et al. 1995; Fornell and Larcker1981), and AVE values exceeded 0.5, the generally accepted criterion (Hu et al. 2004). In addition, in the factor analysis results (see Table 6), all of the measurement items loaded highly on their own constructs but not highly on other constructs. These factor analysis results showed good convergent validity for the measurement items.

Discriminant validity is the degree of difference between a given construct and other constructs. Thus, the measurement items should be distinct from other constructs and load on their own construct. Discriminant validity was assessed by comparison of the square root of AVE and the correlations among constructs. To show good discriminant validity in factor analysis results, all of the items should load highly on their own construct but not highly on other constructs. The factor analysis results satisfied these criteria (see Table 6). Moreover, all the square roots of the AVE should be greater than the off-diagonal elements in the corresponding rows and columns. This result indicates that the construct shares more variance with its measures than with others (Fornell and Larcker 1981). The diagonal values of Table 5, the square roots of AVE, are greater than the correlations among constructs, demonstrating good discriminant validity for all of the constructs. Thus, all conditions for convergent and discriminant validity were satisfied.

To assess common method bias, Harman's one-factor test was performed by principal component factor analysis (Podsakoff et al. 2003), and each factor explains roughly equal variance (from 10 percent to 16 percent). Thus, there is no evidence of common method bias.

Structural Model

With an adequate measurement model, the research hypotheses were tested by the bootstrapping technique in PLS Graph 3.0. The results are shown in Figure 3.

As hypothesized, facial similarity and body similarity have a significant positive effect on avatar identification (H1 and H2). Although the effect of self-satisfaction and negative reaction to scanning on identification was not hypothesized, these constructs increase avatar identification as well. This is consistent with self-consistency motivation in which a person identifies with the avatar that matches his or her self-concept. As expected, avatar identification influenced emotional attachment and perceived diagnosticity (H3, H5), and emotional attachment and perceived diagnosticity increase the intention to use an avatar (H4 and H6). These results show that through the mediation of avatar identification, people perceive favorably an avatar representing their self-concept, and this positive attitude and usefulness of the avatar are important factors for increased intention to use the avatar. In addition, a supplementary analysis was conducted to validate the mediating roles of avatar identification, emotional attachment, and perceived diagnosticity. The three-step method (Baron and Kenny 1986) and Cohen's F2, which examines whether the variance explained through the mediating effect is significant, were performed. As shown in Table 7, mediators in the research model seemed appropriate to examine the effects of avatar similarity on the intention to use an avatar. This is because it fully or partially mediates the impact of avatar similarity on emotional attachment and perceived diagnosticity, and the changes in the R^2 value are quite significant. The insights and implications of this study are presented next.

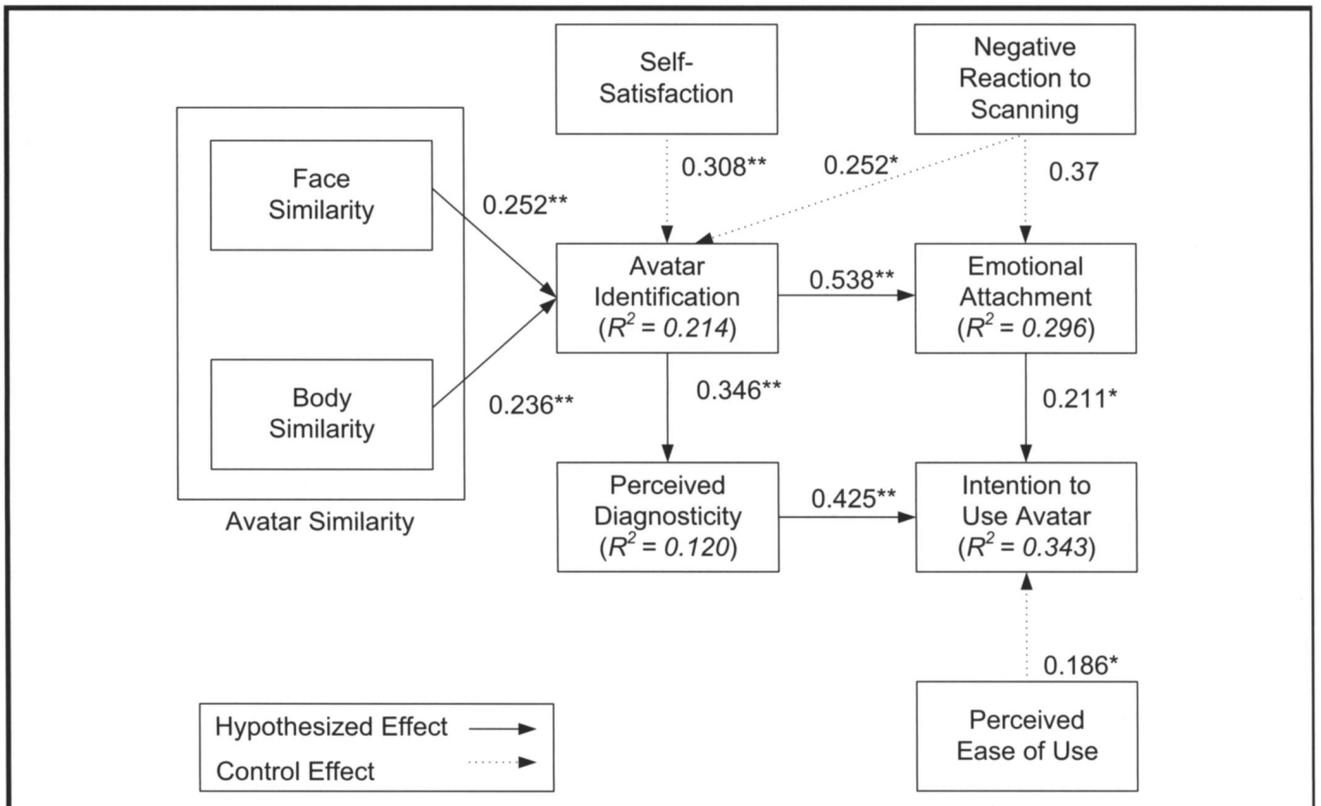
Table 5. Composite Reliability, AVE, and Correlation among Constructs

	CR	AVE	FS	BS	AI	EA	PD	IUA	SS	NRS	PEU
FS	**0.97**	**0.95**	**0.97**								
BS	**0.97**	**0.07**	0.16	**0.98**							
AI	**0.85**	**0.66**	0.27	0.23	**0.81**						
EA	**0.92**	**0.80**	0.35	0.26	0.55	**0.89**					
PD	**0.92**	**0.79**	0.14	0.39	0.35	0.44	**0.89**				
IUA	**0.96**	**0.89**	0.06	0.37	0.19	0.40	0.52	**0.94**			
SS	**0.84**	**0.72**	-0.09	-0.08	0.19	0.18	-0.04	-0.08	**0.85**		
NRS	**0.93**	**0.82**	0.03	-0.08	0.14	0.11	0.07	-0.01	-0.33	**0.91**	
PEU	**0.98**	**0.97**	-0.19	0.06	-0.05	-0.01	0.03	0.20	0.11	-0.24	**0.98**

Note: Diagonal values are the square root of AVE.

Table 6. Factor Analysis Results

	FS	BS	AI	EA	PD	IUA	SS	NRS	PEU
FS1	**0.97**	0.16	0.26	0.35	0.15	0.05	-0.09	0.04	-0.19
FS2	**0.97**	0.15	0.26	0.32	0.11	0.06	-0.07	-0.01	-0.16
BS1	0.16	**0.98**	0.22	0.27	0.38	0.36	-0.08	-0.10	0.07
BS2	0.16	**0.98**	0.23	0.26	0.38	0.38	-0.08	-0.09	0.06
AI1	0.36	0.20	**0.80**	0.34	0.29	0.17	0.03	0.10	-0.10
AI3	0.08	0.23	**0.77**	0.52	0.25	0.21	0.25	0.00	0.03
AI4	0.24	0.14	**0.87**	0.46	0.31	0.09	0.15	0.25	-0.05
EAA1	0.40	0.25	0.65	**0.81**	0.35	0.27	0.06	0.22	-0.07
EAA2	0.42	0.42	0.43	**0.80**	0.47	0.39	0.01	0.10	0.02
EAA3	0.28	0.33	0.53	**0.85**	0.44	0.41	0.17	0.07	0.13
EAA4	0.21	0.33	0.24	**0.72**	0.35	0.36	0.12	-0.04	0.10
EAC1	0.20	0.08	0.41	**0.80**	0.27	0.33	0.27	0.00	-0.02
EAC2	0.27	0.10	0.44	**0.84**	0.24	0.32	0.22	0.10	-0.04
EAC3	0.28	0.00	0.30	**0.68**	0.13	0.16	0.22	0.01	-0.06
EAP1	0.20	0.21	0.44	**0.74**	0.46	0.25	0.07	0.09	-0.09
EAP2	0.22	0.15	0.30	**0.76**	0.39	0.28	0.11	0.12	-0.07
EAP3	0.27	0.24	0.45	**0.90**	0.38	0.36	0.17	0.04	0.06
PD1	0.16	0.35	0.29	0.44	**0.90**	0.42	0.00	0.06	0.04
PD2	0.17	0.36	0.39	0.37	**0.87**	0.45	-0.06	0.08	0.02
PD3	0.02	0.32	0.23	0.37	**0.88**	0.52	-0.03	0.05	0.03
IUA1	-0.02	0.33	0.18	0.40	0.56	**0.94**	-0.07	-0.03	0.23
IUA2	0.12	0.38	0.20	0.35	0.44	**0.93**	-0.09	0.04	0.16
IUA3	0.08	0.35	0.15	0.37	0.47	**0.96**	-0.07	-0.08	0.16
SS1	-0.24	-0.17	0.09	0.07	-0.07	-0.09	**0.74**	-0.32	0.21
SS2	0.01	-0.02	0.19	0.20	-0.01	-0.06	**0.95**	-0.30	0.05
NRS1	-0.02	-0.11	0.14	0.13	0.10	-0.01	-0.31	**0.95**	-0.16
NRS2	0.00	-0.13	0.17	0.02	0.04	-0.06	-0.37	**0.95**	-0.26
NRS3	0.11	0.04	0.06	0.14	0.05	0.05	-0.22	**0.79**	-0.22
PEU3	-0.20	0.09	-0.07	-0.02	0.00	0.20	0.06	-0.21	**0.98**
PEU4	-0.16	0.04	-0.02	0.00	0.07	0.19	0.16	-0.25	**0.98**



Note 1: Emotional attachment is a reflective construct consisting of affection, connection, and passion.
*Denotes significance at the $p < 0.05$ level. **Denotes significance at the $p < 0.01$ level.

Figure 3. Results of PLS Analysis

Table 7. Results of Mediating Effect Tests

IV	M	DV	IV → DV	IV → M	IV + M → DV		Mediating	R^2		ΔR^2	Cohen's F^2
					IV	M		IV + M → DV	IV → DV		
FS	Iden	EA	0.35**	0.33**	0.22**	0.50**	Partial	0.35	0.12	0.23	0.35 (Large)
FS	Iden	PD	0.17	0.33**	0.05	0.35**	Full	0.13	0.03	0.10	0.11 (Small to Medium)
BS	Iden	EA	0.32**	0.24*	0.15	0.52**	Full	0.33	0.11	0.22	0.33 (Medium to Large)
BS	Iden	PD	0.39*	0.24*	0.33*	0.28**	Partial	0.23	0.15	0.08	0.10 (Small to Medium)
Iden	EA	IUA	0.22	0.55**	-0.01	0.40**	Full	0.16	0.05	0.11	0.13 (Small to Medium)
Iden	PD	IUA	0.22	0.36**	0.04	0.51	Full	0.23	0.05	0.23	0.32 (Medium to Large)

**Significant at the 0.01 level. *Significant at the 0.05 level.

Note 1: IV = independent variable; M = mediator; DV = dependent variable.

Note 2: Mediating effects are tested by using the three-step method suggested by Baron and Kenny (1986). (Also see http://davidakenny.net/cm/mediate; accessed August 13, 2008).

Step 1: IV → DV is significant (if Step 2 and Step 3 are satisfied, Step 1 is not necessary).

Step 2: IV → M is significant.

Stpe 3: IV + M → DV: (a) If M is significant and IV is not significant, then M fully mediates the impact of IV on DV.

(b) If both M and IV are significant, then M partially mediates the impact of IV on DV.

Note 3: Cohen's $F^2 = R^2_{IV}/(1 - R^2_{IV+M})$.

Note 4: By convention, Cohen's F^2 of 0.02, 0.15, and 0.35 are considered small, medium, and large, respectively (Cohen 1988).

Discussion and Conclusions

In recent years, the virtual world has been a topic of interest in the IS discipline as an alternative version of the real world. People interact in virtual worlds and establish identities in association with avatars representing themselves. Moreover, increasing cross-over between the virtual and real world extends the use of virtual world technologies to various tasks such as training, shopping, and interactive information presentation. Although these realistic, task-focused virtual world settings are not as intriguing as fantastic virtual worlds in which blue aliens hunt wild beasts and have parties around virtual fires, researchers and practitioners need to pay more attention to realistic, task-focused virtual world settings that are most likely to be relevant to business. In light of these concerns, a new theoretical approach is required for theorizing how users form attitudes and intentions regarding avatars in realistic, task-focused virtual world settings. Founded on dual-congruity perspectives, this study theoretically suggests the role of the self-congruity and functional congruity perspectives of avatars in a virtual apparel store. We empirically investigated the research model, stating that the self-congruity perspectives influence avatar usage by affecting attitudes toward avatars and the functional congruity perspectives (perceived diagnosticity).

The results demonstrate that an avatar that reflects a user's self-concept (facial and body similarity) influences the degree of avatar identification in terms of self-congruity perspectives. In addition, the effects of avatar identification on emotional attachment also were empirically tested. The results show that the self-congruity perspective increases positive attitudes toward an avatar, which affects intention to use an avatar. This is consistent with the previous literature, which speculates that people have positive emotions such as affection, connection, and passion toward avatars and that as the degree of identification with an avatar increases, the more they want to interact with it. In addition, avatar identification helps in evaluating apparel in a virtual apparel store through a biasing effect and a decompositional process, and then increased perceived diagnosticity serves to increase the intention to use self-avatars. Consequently, the dual-congruity model was supported in this context. In other words, this study empirically demonstrated that self-congruity perspectives positively affect functional congruity, and that both of them positively influence avatar use for apparel shopping in virtual worlds.

The results of this study have to be interpreted within the context of several limitations. First, even without either a public or social context, dual-congruity was supported—so this could be seen as a conservative test. Future research should consider how the balance between self-congruity and functional congruity plays out in (1) realistic social virtual worlds (actual self-concept and social identity need to be considered), (2) non-apparel–oriented, realistic virtual worlds (e.g., shopping for furniture, training activities, and plastic surgery), and (3) nonrealistic/fantastical virtual worlds (ideal self-concept needs to be considered). Second, the participants in this study were college students who may not precisely represent the population of users in virtual words. However, because the participants have the potential to become heavy virtual world users and 97 percent of the participants have had previous experience in online shopping, the use of students was not a significant threat to external validity (McKnight et al. 2002). Two other limitations are insufficient avatar similarity and the use of a narrow slice of the shopping experience (trying on apparel), both of which are due to a lack of technology. Although this study adopted commercially available 3D scanning technology, the perceived facial similarity scores, compared with perceived body similarity scores, were relatively low. In addition, intention to use an avatar is not precisely the same as actual avatar usage, although in the IS discipline intention to use has been considered a predictor of behavior (Ajzen 1991; Sheppard et al. 1988; Taylor and Todd 1995; Venkatesh et al.2003).

Even with these limitations, however, this study has both theoretical and practical implications. From an academic viewpoint, the conceptual framework may be applied to the examination of preferences, if any, for the characteristics of an avatar and to why people choose an avatar that does or does not resemble them. For instance, when people wanted to be totally different as a way to escape their daily life, they preferred an avatar with an appearance that projected a certain personality, mood, or role (ideal self-concept). On the other hand, people who like their role playing to be exactly like their real life are likely to use an avatar that resembles them so as to transfer their real-world identity into a virtual world. In addition, this framework may be applied to the investigation of users' behavior (e.g., shopping virtual products, loyalty to the avatar/the virtual world, etc.) in virtual worlds. In addition, a laboratory experiment empirically investigated the impact of avatar similarity on avatar use based on dual-congruity perspectives. To the best of our knowledge, the extent of our research on the influence of avatar similarities sets our study apart and defines its value to the IS discipline. Despite the presence of avatars as one of the most distinctive elements of virtual worlds, few studies have investigated the influence of avatar characteristics (e.g., avatar similarity) on avatar usage in terms of value expressive and utilitarian perspectives. Thus, this study in the IS discipline sheds light on the concept of congruity between avatars and a person's actual self in terms of avatar similarity. We also investigated the effects of self-congruity perspectives on functional con-

gruity and the use of an avatar for apparel shopping in virtual worlds. Furthermore, by introducing into the IS discipline dual-congruity perspectives that have been widely adopted in such areas as advertising, consumer behavior, and organizations, this study proposes a general conceptual framework that may be applied to various studies related to an avatar in virtual worlds. Finally, by adapting the concept of congruity to an avatar in virtual worlds, we extend the use of this concept that previously has been limited to applications in organizational and consumer research.

From a practical viewpoint, the current study provides useful guidelines for virtual world providers and application developers. In the business areas related to realistic, task-focused virtual contexts (e.g., virtual apparel shopping, matchmaking, plastic surgery, fitness clubs, etc.), if virtual world providers want to increase avatar use and users' intention to use their services, they can achieve it by providing self-avatars that resemble users' physical appearances. The increased cognitive connection achieved through facial and body similarities between users and their avatars builds positive attitudes (e.g., affection, connection, and passion), which in turn increase the usefulness of an avatar. In addition, such cognitive connections not only positively influence the usefulness of an avatar, but also increase intention to use an avatar. Thus, if virtual world providers wish to develop task-focused virtual contexts (such as apparel shopping malls and diet programs) that are connected with users in the real world, they need to consider adopting and developing avatars capable of reflecting their users' self-concepts.

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