USING AUGMENTED REALITY TO REINFORCE VIVID MEMORIES AND PRODUCE A DIGITAL INTERACTIVE EXPERIENCE

Tseng-Lung Huang*
College of Management
Yuan Ze University
135 Yuan-Tung Road, Zhongli Dist., Taoyuan City 32003, Taiwan
blessing@saturn.yzu.edu.tw

Chung-Hui Tseng
Department of International Business
Tamkang University
No.151, Yingzhuan Rd., Tamsui Dist., New Taipei City 25137, Taiwan
136466@mail.tku.edu.tw

ABSTRACT

This study determined that in an interactive augmented-reality context, vivid memories substantially influence four types of online exploratory consumption behavior (i.e., concentration, exploratory consumption behavior, playfulness, and time distortion), based on script theory. In addition, this study indicates that in an interactive augmented-reality context, consumers' sense of ownership control and autotelic need for touch significantly influence the relationship between vivid memories and the four types of exploratory consumption behavior, based on self-referencing theory. The results of this study can assist online vendors in using augmented-reality interactive technology for establishing consumer persuasion models.

Keywords: Ownership control; Need for touch; Vividness memories; Augmented-reality; Interactive technology (ARIT)

1. Introduction

Because online consumers increasingly seek to receive visual and tactile stimulation [Karimov et al. 2011; Sautter et al. 2004; Song & Kim 2012; Suntornpithug & Khamalah 2010], online retailers' adoption of multisensory augmented-reality interactive technology (ARIT) to provide consumers with a tactile experience of commodities has become a trend in online shopping [Spence & Gallace 2011]. Online retailers have determined that a considerably higher proportion of first-time visitors to online shopping websites that use ARIT become loyal consumers, compared with 57% of first-time visitors to online shopping websites that do not use ARIT [e.g., traditional auction websites or shopping malls; Demery 2010]. In other words, ARIT has become an optimal measure for establishing an online shopping experience [Cui et al. 2011; Prahalad & Ramaswamy 2004].

As shown in Figure 1, ARIT uses three-dimensional (3D) visual and auditory effects and haptic imagery to provide consumers with an online clothes-fitting experience [Kalckert & Ehrsson 2012]. Accordingly, ARIT enables online consumers to adjust the size of fashion products and select various types of clothing as well as determine immediately whether the fashion products or clothes fit their face shapes and physiques. By contrast, traditional online stores enable consumers to view how fashion products or clothes appear only on models [Peck et al. 2013; Song & Kim 2012]. In addition, ARIT creates a virtual environment in which consumers can try on clothes or fashion products [Tang et al. 2004]. Thus, ARIT combines virtual fashion products and consumer images to provide online consumers with a virtual clothes-fitting experience [Azuma 1997; Benford et al. 1998; van Krevelen & Poelman 2010].

ARIT overlays digital information to the user's perception of the physical world. The technology can provide users with information that is contextually personally meaningful and pleasurable. Interacting with different environments through ARIT could provide rich and novel experiences [Olsson et al. 2013]. The current trends in applying ARIT indicate that the focus of interactive technology is shifting from usability or functionality problems to providing consumers with a rich, stimulating, and pleasurable user experience [Fogg 2003; Garrett 2011].

* Corresponding author

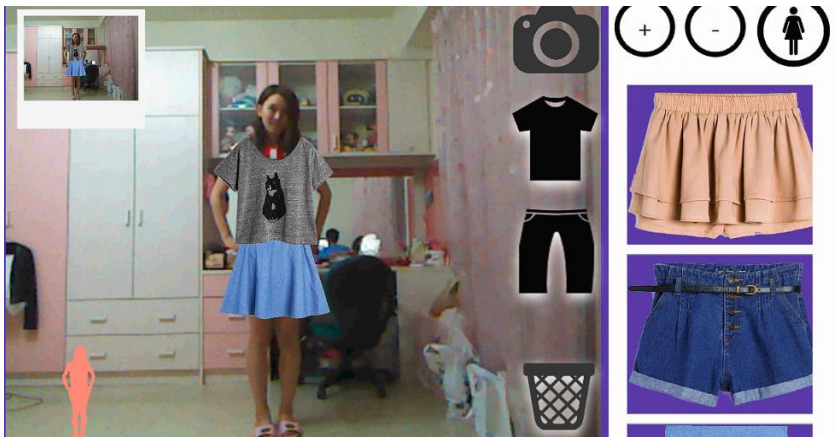

Figure 1: Augmented-reality Interactive Technology (ARIT)
Source: this research

During virtual augmented-reality clothes-fitting processes, online consumers can gain a sense of ownership control and immersive experience by mental simulation (e.g., haptic and 3D visual imagery used to simulate the touching of products) [Chark & Muthukrishnan 2013; Kilteni et al. 2012; Song & Kim 2012]. Mental simulation enables vivid memories of consumption experience to be evoked and activated [Segovia & Bailenson 2009], and subsequent exploration and persistent consumption behavior can be induced [Manthiou et al. 2014; Singer & Salovey 1993]. Vivid memories can be considered a basis and script for forming a subsequent virtual experience and exploratory consumption behavior in an augmented-reality environment. Script theory states that vivid memories provide a script to consumers, which produces subsequent consumption behavior [Erasmus et al. 2002].

Most previous studies on augmented reality [e.g., Coovert et al. 2014; Cai et al. 2014] have applied ARIT to learning. In other words, previous studies have focused on using visual effects for reinforcing communication and learning, but these studies have not investigated how vivid memories affect subsequent consumption behavior. In addition, previous studies on vivid memories [e.g., Tung & Ritchie 2011] have not clearly identified the types of exploratory consumption behavior that can be induced by vivid memories, particularly in an online augmented-reality consumption context. To supplement the insufficient research on vivid memories, the present study examined the relationship between vivid memories and exploratory consumption experience according to script theory.

The degree of consumers' self-referencing is essential in using mental simulation to create a virtual consumption experience [Escalas 2004]. Furthermore, the degree of self-referencing influences the degree to which vivid memories can be activated and evoked [Symons & Johnson 1997]. In other words, self-referencing affects vivid memories and the relationship between vivid memories and an exploratory consumption experience. Most previous studies on self-referencing have been limited to an advertising context [e.g., Burnkrant & Unnava 1995] and rarely applied self-referencing to online augmented-reality consumption experience. Accordingly, previous studies have used a text mode for creating a first-person self-referencing effect but have not applied a strong sense of ownership to create such an effect [Cunningham et al. 2008; Serbun et al. 2011]. Because online augmented reality emphasizes the importance of a strong sense of ownership control for consumption experience, a self-referencing effect caused by a sense of ownership is crucial. To supplement the insufficient research on self-referencing, this study investigated how to use a sense of ownership for creating a self-referencing effect and examined how a sense of ownership affects the relationship between vivid memories and exploratory consumption experience.

Augmented reality mainly applies 3D visual and auditory effects and haptic imagery to provide a mental-simulation experience to consumers [Kilteni et al. 2012]. Previous consumer studies [Peck & Johnson 2011] have indicated that consumers with a high autotelic need for touch can satisfactorily process visual and tactile image information. Predictably, the degree of autotelic need for touch affects the results of using ARIT for creating visual and auditory effects and haptic imagery and thus activating vivid memories. Similarly, the degree of autotelic need for touch should affect the relationship between vivid memories and exploratory consumption experience. This study investigated how the autotelic need for touch affects the relationship between vivid memories and exploratory consumption experience. The results of this study can guide ARIT makers in designing an experiential method for persuading consumers. The purposes of this study are as follows:

(1) To investigate the relationship between vivid memories and exploratory consumption experience in an ARIT context according to script theory;

(2) To investigate how consumers' sense of ownership affects the relationship between vivid memories and exploratory consumption experience in an ARIT context;
(3) To investigate how consumers' autotelic need for touch affects the relationship between vivid memories and exploratory consumption experience in an ARIT context.

2. Theoretical Background and Hypothesis Development

Through sensory systems, people store their consumption experience in the brain. The sensory experience of consumers can thus activate their vivid memories regarding their previous consumption experience [Brakus et al. 2009]. As indicated by script theory, sensory experience can successfully form a script for subsequent consumption experience and behavior through vivid memories [Manthiou et al. 2014]. A multisensory augmented-reality interactive experience resulting from 3D visual and auditory effects and haptic imagery can activate the vivid memories of online consumers and guide consumer behavior. This viewpoint is consistent with script theory. Script theory and the relationship between script theory and an augmented-reality interactive consumption experience is explained in the following section.

2.1 Script Theory

According to script theory, consumers organize specific events into event schemata according to the causal sequence of the specific events. An event schema is a type of memory structure characterized by time and a causal sequence [Whitney & John 1983]. In a memory structure, events influence one another, and actions influence one another [Erasmus et al. 2002]. The consumption memory structure derived from learning is crucial for guiding consumer behavior [Bozinoff & Roth 1983; Abelson 1981]. As indicated by script theory, in addition to guiding consumer behavior, an experience and memory structure enable consumers, according to specific situational characteristics and operation models, to exhibit a series of adequate consumption behavior (including planning and understanding consumption contexts and activities) and acquire a complete consumption experience [Bower et al. 1979; Puto 1985; Leigh & Rethans 1983]. Using environmental factors to activate the consumption memory structure can directly help consumers rapidly integrate into the current consumption context, thereby preventing information overload, substantially reducing information-processing workload and learning costs [Bozinoff & Roth 1983; Martin 1991; Taylor et al. 1991], and successfully inducing subsequent consumption behavior [Stoltman et al. 1989; Sutherland 1995]. When experiencing a novel consumption context, consumers use their knowledge and memory structures to interpret the use model of new products or services and successfully acquire a new consumption experience [Mathieu & Marco 2014].

Script theory suggests that activating consumption memory is crucial for enabling consumers to rapidly integrate into online consumption activities and explorations. A memory structure is primarily activated by the interaction between consumers and their contexts [Nottenburg & Shoben 1980]. In particular, consumption memory can be activated to the highest degree in an interactive context that provides a sensory experience to consumers [Brakus et al. 2009; Manthiou et al. 2014]. ARIT that provides an interactive sensory experience produces visual effects of various types of fashion products and enables consumers to acquire multisensory experiences such as adjusting the size of clothes [Tang et al. 2004], and determine immediately whether fashion products fit their face shapes and physiques [Peck et al. 2013], thus providing online consumers with a virtual clothes-fitting experience [Azuma 1997; Benford et al. 1998; van Krevelen & Poelman 2010]. ARIT provides consumers with a virtual interactive clothes-fitting experience (i.e., experience of direct interaction between consumers and fashion products) and activates consumers' memories of their previous clothes-fitting experiences, thereby enabling consumers to rapidly integrate themselves into online clothes-fitting activities and explorations. This viewpoint is consistent with script theory.

2.2 Vivid Memories

Activating previous consumption experience means inspiring vivid memories. The vivid memories of consumers can persistently influence their subsequent consumption behavior [Manthiou et al. 2014; Tung & Ritchie 2011]. Vivid memories can be activated by various types of sensory experience [Rubin & Kozin 1984; Rubin et al. 2003]. This sensory component has the following characteristics: vividness, coherence, sensory detail, emotional intensity, and visual perspective [Sutin & Robins 2007]. *Vividness* refers to the visual clarity and intensity of an experience stored in the memory; these are the most crucial elements of vivid memories [Greenberg & Rubin 2003]. The consumption memory of consumers is a narrative structure that contains the first, middle, and final parts of a coherent story [Adval & Wyer 1998]. When people recall previous events, they recall when and where the events occurred and the sequence of the events. Therefore, memory is characterized by coherence [Sutin & Robins 2007]. *Sensory detail* refers to the amount of sensory detail when consumers reexperience previous events in their memories [Sutin & Robins 2007]. In addition, the amount of sensory detail is greater for real events than it is for imaginary experience [Suengas & Johnson 1988]. The interaction between people and their surroundings can create an emotional experience and memory with a certain emotional intensity level [Dubé & Menon 2000; Thompson et al. 1996]. Finally, people can recall previous

events from a first- or third-person visual perspective. When people recall previous events from a first-person perspective, they reexperience the events from their own viewpoint. By contrast, when people recall previous events from a third-person perspective, they reexperience the events from other people's standpoints [Libby & Eibach 2002].

Because consumption is a sensory experience, such an experience can activate memories or become a memory [Brakus et al. 2009; Kim 2010; Manthiou et al. 2014]. ARIT creates 3D visual and auditory effects as well as haptic imagery and provides a multisensory consumption experience [Kalckert & Ehrsson 2012; Merle et al. 2012; Peck et al. 2013; Tang et al. 2004; van Krevelen & Poelman 2010] to evoke consumers' vivid memories (particularly vivid memories of clothes fitting). Sutin and Robins [2007] showed that a larger sensory component related to vividness, coherence, sensory detail, emotional intensity, and visual perspective renders memory more vividly. In addition, vivid memories can further motivate people to learn and enhance their learning performance. The current study considered factors such as vividness, coherence, sensory detail, emotional intensity, and visual perspective and examined how ARIT successfully evokes consumers' vivid memories. Furthermore, this study predicted that vivid memories evoked by a multisensory augmented-reality interactive experience can substantially affect subsequent online exploratory behavior and consumption experience.

2.3 Relationship Between Vivid Memories and Exploratory Consumption Experience

According to script theory [Erasmus et al. 2002], activating vivid memories enables consumers to understand the characteristics of current consumption experience, which affects their subsequent exploratory behavior and consumption experience. Numerous psychological studies [Bernstein & Loftus 2009; Pillemer 1998, 2003; Roediger & Amir 2005] have shown that during decision making, consumers search their explicit and implicit memories for related experience and information to solve their problems; therefore, their consumption attitude and behavior are modified according to their activated memories. Vivid memories can aid people in persistently pursuing their goals [Singer & Salovey 1993] and can substantially influence the quality of exploratory consumption experience.

Regarding exploratory consumption experience, Hoffman and Novak [1996] and other researchers have shown that an optimal online exploratory consumption experience has four characteristics (i.e., concentration, exploratory behavior, playfulness, and time distortion) [Chou & Ting 2003; Ghani et al. 1991; Ghani & Deshpande 1994; Hoffman & Novak 1996; Novak et al. 2000; Novak et al. 2003; Sautter et al. 2004; Skadberg & Kimmel 2004; Takatalo et al. 2011; Trevino & Webster 1992; Webster et al. 1993]. *Concentration* indicates that consumers are immersed in a consumption context and their attention is completely focused on specific targets [Csikszentmihalyi 1975]. Consumers with a high degree of concentration focus on specific targets and disregard irrelevant information [Webster et al. 1993]. Balasubramanian et al. [2005] stated that when the vivid memories of consumers are evoked, the consumers use their vivid memories as scripts for a subsequent consumption experience, removing irrelevant information and focusing on the script. Vivid memories evoked by a multisensory augmented-reality interactive experience can positively enhance the concentration level of online consumers.

Furthermore, online exploratory consumption behavior involves consumers' clicking on various parts of a website, viewing various images, and simulating product use. For example, an online camera can be used for capturing clothes-fitting effects, and clothes-fitting images can be enlarged or reduced to obtain further product information [Demangeot & Broderick 2009]. Online consumers must visit a website before their online exploratory consumption behavior occurs [Demangeot & Broderick 2009]. The goals and motivations of consumers determine their consumption experience and behavior [Hoffman & Novak 1996]. In addition, autotelic experience is crucial because it elicits the subsequent active exploratory consumption behavior of consumers [Nel et al. 1999]. In other words, eliciting online exploratory consumption behavior depends on a clear and organized script that guides the behavior of online consumers [Kaplan 1992]. Consumers' memories of previous consumption experience contain information regarding specific shopping rituals. Vivid memories of shopping rituals can serve as a script for website browsing and enhance the willingness of consumers to view website [Balasubramanian et al. 2005]. Therefore, vivid memories evoked by an interactive augmented-reality experience provide online consumers with a script and goal for explorations and enhance the willingness of consumers to actively explore consumption behavior.

Specific shopping rituals stored in the memories of consumers enable online consumers to browse websites efficiently, acquire consumption experience cost-effectively, and enjoy playful explorations [Balasubramanian et al. 2005]. In addition, shopping rituals stored in consumers' memories can stimulate the desire of consumers for an optimal consumption experience and help them immerse themselves in consumption activities. The intrinsic desire of consumers is crucial for online playfulness [Mathwick et al. 2001]. Therefore, consumers who have strong vivid memories derived from an interactive augmented-reality experience should have a high degree of perceived playfulness.

When consumers experience playful consumption activities, they experience an alteration of time or forget about time. This phenomenon is called time distortion [Csikszentmihalyi 1975]. Time distortion occurs because consumers allocate their mental resources and time to playful information during playful consumption activities [Hoffman &

Novak 1996] and are thus distanced from reality, forget about time, and continue to enjoy their consumption activities [Mathwick et al. 2001]. According to the literature, activating vivid memories of shopping rituals can help online consumers immerse themselves in online shopping activities and acquire a positive and active playful consumption experience. Occasionally, consumers are excitedly and completely immersed in consumption activities and thus forget about time [Balasubramanian et al. 2005]. In an ARIT context, vivid memories help online consumers acquire a playful consumption experience and are crucial in enabling consumers to enjoy consumption activities, which causes time distortion. Accordingly, we proposed the following hypotheses:

H1a*. Vivid memories positively influence concentration.*
H1b*. Vivid memories positively influence exploratory behavior.*
H1c*. Vivid memories positively influence playfulness.*
H1d*. Vivid memories positively influence time distortion.*

2.4 lf-Referencing and the Moderating Effects of Sense of Ownership Control

If people hold memories of an experience closely and view the experience as being enjoyable, they likely exhibit active consumption behavior [Clotfelter 2001; Harrison et al. 1995; Kuwabara & Pillemer 2010; Quigley et al. 2002]. Self-referencing is an optimal method for guiding consumers to associate their memories with persuasive information and subsequent behavior [Symons & Johnson 1997]. Self-referencing is a mental-simulation mechanism through which people use their experience to interpret, construct, and process information [Escalas 2004]. A high degree of self-referencing causes consumers, previous consumption experience, and new product information to be closely associated with one another. In addition, self-referencing can activate vivid memories and induce positive consumption attitude and behavior [Kensinger et al. 2006; Serbun et al. 2011; Petty & Cacioppo 1986]. Furthermore, consumers who assume a first-person perspective (rather than a third-person perspective) can process advertising information at a high degree of self-referencing. Accordingly, the vivid memories of the consumer are activated, and the consumer strongly agrees with the advertising information and exhibits positive consumption attitude and behavior [Burnkrant & Unnava 1995; Debevec & Iyer 1988; Debevec & Romeo 1992]. ARIT enables consumers to try on fashion products from a first-person perspective and acquire a highly self-referencing experience. Therefore, self-referencing is crucial in an ARIT context.

Self-referencing has mainly been applied in advertising contexts [e.g., Burnkrant & Unna 1995]. However, using a high degree of self-referencing for activating consumption memories and affecting consumption behavior is not limited to a text-based or advertising context. A sense of ownership can yield a strong self-referencing effect, further activate vivid consumption memories, and induce consumption attitude and behavior [Serbun et al. 2011]. For example, consumers who have a strong sense of ownership of a product use self-referencing for activating their memories of the product more accurately than do other consumers who have a weak sense of ownership of the product [Cunningham et al. 2008]. Therefore, a strong sense of ownership yields a strong self-referencing effect and activates consumption memories. In addition, when consumers use their sense of ownership for producing a self-referencing effect, they extend the images of themselves to a product. Therefore, the characteristics of the product are strongly associated with the memories of consumers, who subsequently exhibit a positive attitude and behavior toward the product [Serbun et al. 2011]. In other words, a strong sense of ownership can strengthen the relationship between vivid memories and subsequent consumption behavior.

In an online augmented-reality interactive context, a sense of ownership control is a prerequisite for a strong sense of ownership [Kalckert & Ehrsson 2012; Peck et al. 2013]. A sense of ownership control refers to the perception of consumers regarding control of an artificial body in an online context, including their perception toward action, control, intention, movement selection, and free will [Blanke & Metzinger 2009]. When online consumers freely control an artificial body in an online context, they have strong senses of ownership control [David et al. 2008; Haggard 2005; Kilteni et al. 2012] and ownership [Kalckert & Ehrsson 2012]. A strong sense of ownership control elicited by an online augmented-reality context can yield a substantial self-referencing effect [Serbun et al. 2011], which can then activate memories of a clothes-fitting experience. In addition, online consumers can actively extend the images of themselves to include online fashion products during self-referencing processes and thus subsequently exhibit a highly positive consumption attitude and behavior toward the fashion products [Serbun et al. 2011]. A sense of ownership control considerably influences the relationship between vivid memories and subsequent exploratory consumption behavior.

In an online augmented-reality context, consumers with a strong sense of ownership control can use a self-referencing method for freely browsing, changing, adjusting, and selecting various fashion products according to vivid experiences and memories, thus exhibiting exploratory behavior. Visual messages regarding the translation and rotation of online consumers' bodies can be accurately expressed using a strong sense of ownership control to produce a visual and tactile synchronous effect [Blanke & Metzinger 2009]. Accordingly, online consumers can freely explore

and easily achieve their action goals. Therefore, the attention of consumers is attracted to the high playfulness of online clothes-fitting activities, and consumers enjoy consumption activities immensely and forget about time. By contrast, online consumers with a weak sense of ownership control cannot have a strong sense of ownership or produce a substantial self-referencing effect and thus cannot activate their vivid memories or exhibit subsequent exploratory consumption behavior. Accordingly, such consumers cannot freely enjoy online clothes-fitting activities on the basis of personal experience and memories. According to the aforementioned description, we proposed the following hypotheses regarding the moderating role of sense of ownership control:

H2a. *Sense of ownership control moderates the relationship between vivid memories and concentration.*
H2b. *Sense of ownership control moderates the relationship between vivid memories and exploratory behavior.*
H2c. *Sense of ownership control moderates the relationship between vivid memories and playfulness.*
H2d. *Sense of ownership control moderates the relationship between vivid memories and time distortion.*

2.5 Moderating Effects of Autotelic Need for Touch

According to previous studies on memory [Kensinger et al. 2006; Serbun et al. 2011; Symons & Johnson 1997], the degree of self-referencing substantially influences the relationship between vivid memories and exploratory behavior. Regarding an online augmented-reality interactive experience, a high degree of self-referencing originates from multisensory stimulation (e.g., haptic imagery) [Kalckert & Ehrsson 2012; Peck et al. 2013]. The degree of preference for using a touch mode to process information varies among consumers [Peck & Childers 2003b], and the degree of consumers' need for touch influences the relationship between vivid memories and exploratory behavior. The need for touch refers to the degree to which consumers prefer to use their touch or haptic systems to process, extract, and use information [Peck & Childers 2003a]. The need for touch can be categorized as autotelic or instrumental [Peck & Johnson 2011]. Autotelic need for touch refers to consumers spontaneously touching products for enjoyment and to satisfy their curiosity [Holbrook & Hirschman 1982]. Therefore, touching products for pleasure and enjoyment is the main purpose of consumer consumption activities, and consumers cannot resist exploring novelties through touch [Keng et al. 2012]. Instrumental need for touch has a prepurchase goal and is not spontaneous [Peck & Johnson 2011]. This study investigated the relationship between vivid memories of online clothes-fitting experience and various types of exploratory and spontaneous behavior by using autotelic need for touch as the main variable.

Consumers with a high autotelic need for touch prefer to use their haptic systems to experience consumption activities and obtain product information [Peck & Johnson 2011; Yazdanparast & Spears 2012]. When product information is presented in a haptic mode, consumers with a high autotelic need for touch can easily retrieve previous haptic information from their memories [Peck & Wiggins 2006]; they can then use systematic information-processing to examine the relationship between the new haptic information and their memories and knowledge [Yazdanparast & Spears 2012], thereby stimulating their curiosity [Holbrook & Hirschman 1982] and desire to explore novelties [Keng et al. 2012]. ARIT creates haptic imagery to provide haptic product information, attract the attention of consumers with a high autotelic need for touch, and motivate consumers to use a high degree of self-referencing for activating vivid memories, inducing curiosity and exploratory behavior, and producing an appealing and joyful persuasive effect [Peck & Johnson 2011].

Consumers with a low autotelic need for touch have neither the motivation nor the ability to process haptic information [Peck & Childers 2003a]; thus, augmented-reality interactive activities that create haptic imagery cannot successfully attract the attention of such consumers. In addition, consumers with a low autotelic need for touch cannot rapidly acquire a haptic consumption experience [Peck & Johnson 2011] and thus cannot use a high degree of self-referencing to activate vivid memories. Consequently, such consumers cannot exhibit spontaneous exploratory consumption behavior. In other words, the degree of autotelic need for touch affects the activation of vivid memories and reduces the self-referencing effect of consumers. In particular, a higher autotelic need for touch renders memories and scripts for activating haptic experience more vivid and concrete. Accordingly, consumers can use their vivid memories for exploring and experiencing consumption activities. This study proposed the following hypotheses regarding the moderating roles of autotelic need for touch:

H3a. *Autotelic need for touch moderates the relationship between vivid memories and concentration.*
H3b. *Autotelic need for touch moderates the relationship between vivid memories and exploratory behavior.*
H3c. *Autotelic need for touch moderates the relationship between vivid memories and playfulness.*
H3d. *Autotelic need for touch moderates the relationship between vivid memories and time distortion.*

Figure 2 shows the research framework of this study based on the aforementioned hypotheses.

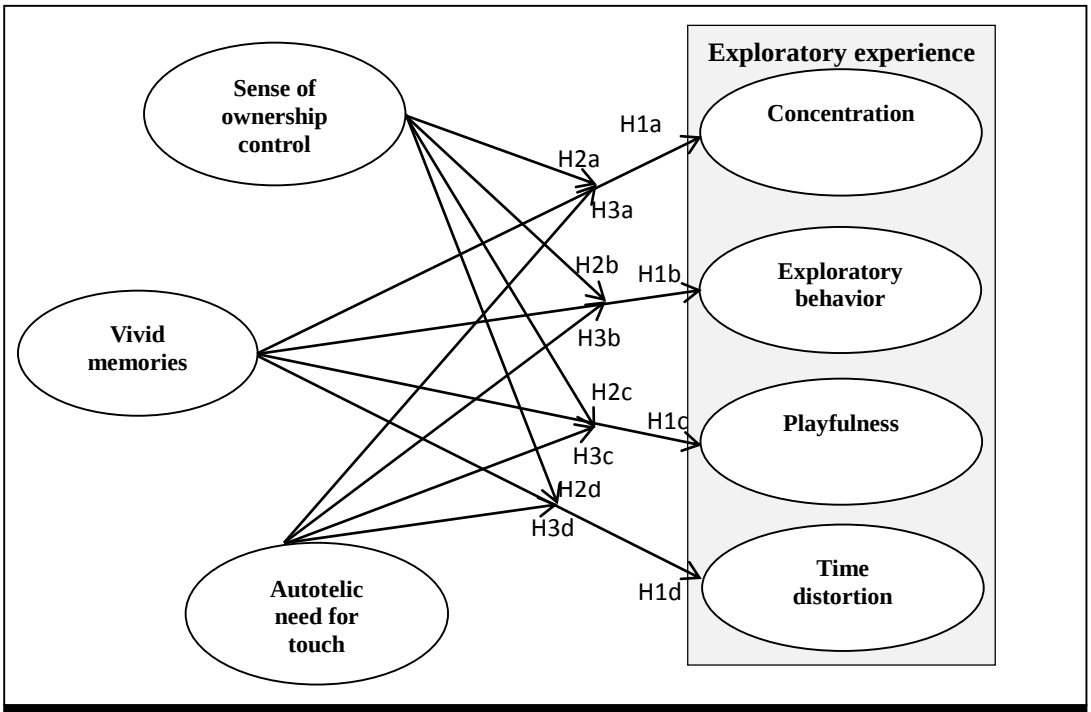

Figure 2: Research Model

3. Method

3.1 Laboratory Study

To test the aforementioned hypotheses, a task-oriented method was applied. According to an eMarketer survey, the sales volume for online apparel and accessories has rapidly increased. Apparel and accessories are the best-selling products in e-commerce [eMarketer 2012]. ARIT was employed in an online clothes-fitting context (Figure 1), and snowball sampling was applied through e-mail to invite online consumers to use ARIT and try on online apparel. To broaden the profile of our user data, invitation letters were also posted on the bulletin boards of online shopping websites, inviting online shoppers of both sexes and with various educational backgrounds and shopping habits to participate in the study.

The online consumers who consented to participate in this study were brought into a laboratory. After the researcher explained the research procedure and purpose of the online clothes-fitting software to the participants, the researcher left the laboratory and the participants freely tried on online apparel without interruption (Figure 1). The participants were free to leave the laboratory anytime, regardless of whether they had completed the task. Subsequently, the participants completed an anonymous questionnaire. After completing the questionnaire, the participants received a gift for participating. The items that the participants tried on included women's and men's apparel. The women's items included 17 types of apparel (e.g., dresses). The men's items included four types of apparel (e.g., shirts, sweaters, and T-shirts). The apparel could be tried on in 13 colors.

To determine whether the direct effects of the vivid memories in an ARIT try-on environment are stronger than those in a non-ARIT try-on environment, a website with a static display of apparel items (labeled as a non-ARIT context) was designed for the control group (Figure 3). In non-ARIT try-on environments, online users use a mouse to view static pictures of clothes on unfamiliar people in a traditional online store. A non-ARIT environment cannot show users' facial expression, appearance, skin color, or body shape and cannot provide interactive enlargement, reduction, movement, rotation, or photographic functions. In brief, non-ARIT and ARIT can be used to display the same number and style of clothes; the differences between them are whether the display is static or dynamic and whether users can actively try on clothes.

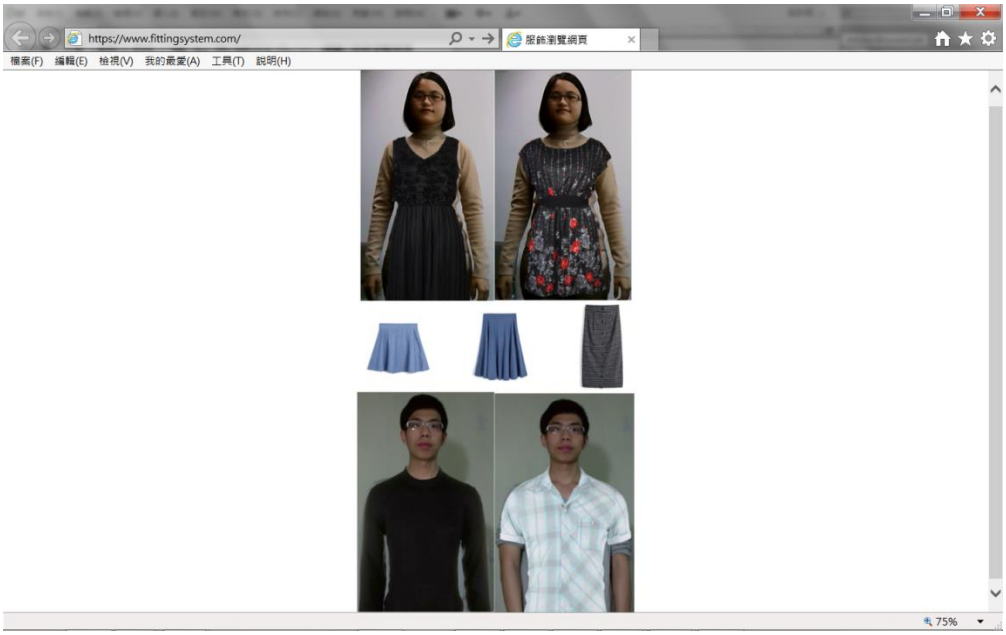

Figure 3: Online Non-ARIT Try-on Environment
(static pictures of fitting clothes from unfamiliar persons or models)
Source: this research

3.2 Questionnaire Design and Measures

Questions were adopted from previous studies and amended according to the research context (Appendix I). For example, the questions on vivid memories (i.e., a second-order factor) were based on Sutin and Robins [2007]. The questions on concentration, exploratory behavior, playfulness, and time distortion were adopted from Chou and Ting [2003]. Sense of ownership control questions were adopted mainly from Kalckert and Ehrsson [2012], and the questions on autotelic need for touch were based on Peck and Johnson [2011]. Finally, self-referencing questions (i.e., a first-order factor) were adopted mainly from Burnkrant and Unnava [1995]. The accuracy of the questionnaire items was improved according to the results of a pilot study involving 30 online shoppers. The responses to each question were scored on a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

To extend the results of previous vivid memory research, this study attempted to predict how vivid memories created using ARIT would affect exploratory experience (including concentration, exploratory behavior, playfulness, and time distortion) on the basis of the perspective of script theory, and to explain the moderating roles of ownership control and autotelic need for touch. Following the suggestion of Chin et al. [1996], partial least squares (PLS) path modeling, which is appropriate for examining a research hypothesis if a research model is still being developed (including theory development, exploratory research, and testing) [Teo et al. 2003], was used for validating the research model relationship [Hair et al. 2011; Ringle et al. 2012].

This study devised a script-theory based view of how vivid memories influence exploratory experience. The main research objectives of this study were theory development, exploratory research, and testing. Therefore, PLS path modeling was appropriate for this study. However, following the suggestion of Ringle et al. [2012], PLS-SEM) was applied to overcome problematic model identification issues, and it was effective for analyzing complex models by using smaller samples [Hair et al. 2011]. Specifically, SmartPLS [Ringle et al. 2007] was used for performing structural equation modeling (SEM) and evaluating both the quality of the measurement model and the interrelationships among the structural model constructs.

4. Results

4.1 Data Analysis

A total of 336 valid questionnaires were collected from online consumers in Taiwan. Among the respondents, 40% were male. In addition, the frequency at which the respondents browsed online apparel differed: the respondents browsed multiple times per day (14%), once per day (8%), once every 3 days (21%), once per week (16%), once every 2 weeks (10%), once per month (14%), or once every 2 months (17%). Furthermore, 10%, 20%, and 70% of the respondents browsed for 5 hr or less, 6–9 hr, and 10 hr or more, respectively, each browsing session. Among the

respondents, 30%, 44%, and 26% spent US$20 or less, US$21–40, and US$41 or more, respectively, on online apparel during each browsing session. In addition, 50% of the respondents had a monthly disposable income of less than US$166, 35% had a monthly disposable income of US$167–333 per month, and 15% had a monthly disposable income of more than US$334; 20% were younger than 20 years, 70% were aged 20–24 years, and 10% were older than 25 years; and 90% had a bachelor's degree and 10% had a high school degree or lower.

To ensure that the limited number of participants did not introduce data bias, we compared our data profile with the data from the 2014 Eastern Integrated Consumer Profile (E-ICP), a database representative of the population of Taiwan consumers. The 2014 E-ICP data were widely collected by randomly sampling consumers in Taiwan aged 13–64. As shown in Table 1, comparing our participant data with that of the 2014 E-ICP revealed only nonsignificant differences in average amount spent in online purchases, educational background, and sex distribution. Therefore, the generalizability of our data is satisfactory.

Table 1: Profiles of the User Data in This Study vs. The Data in 2014 E-ICP

The user data in our study	The data in 2014 E-ICP	T-test (t-value; p-value)
To spent US$20 or less (30%), US$21–40 (44%), and US$41 or more (26%) to purchase online apparel during each browsing session.	To spent US$20 or less (37%), US$21–40 (33%), and US$41 or more (27%) to purchase online apparel during each browsing session.	t = 0.162; p = 0.879
90% had acquired bachelor's degrees, and 10% had acquired high school degrees or lower	75% had acquired bachelor's degrees, and 22% had acquired high school degrees or lower	t = 0.031; p = 0.978
40% were male and 60% female	40% were male and 60% female	t = 0.00; p = 1.00

Notes: The data in 2014 E-ICP, contains 2000 people in Taiwan, was collected by a two-stage randomly stratified sampling from Taiwan population (http://www.isurvey.com.tw/3_product/1_eicp.aspx).

4.2 Measurement Validity: Convergent Validity and Discriminant Validity

First, the reliability and validity of each variable were verified. Table 2 lists information on the loadings of the research model measures. All the items yielded significant path loadings at the 0.01 level and nearly exceeded or exceeded 0.70. The Cronbach's alpha values ranged from 0.80 to 0.93 for the nine constructs. All the values exceeded 0.70, indicating a high internal consistency of the measure reliability [Nunnally 1978]. Composite reliability obtained for the constructs by examining ρ_c exceeded the suggested threshold of 0.70 in all cases, indicating favorable reliability. This study assessed convergent validity by using the average variance extracted (AVE) and ratio of construct variance to total variance among indicators. Table 2 presents the AVE values for the seven constructs, all of which exceeded 0.50 [Barclay et al. 1995], confirming that all the measures exhibited satisfactory convergent validity.

Table 2: Results of measurement properties

Construct	Items	Factor loading[a]	Cronbach's alpha	Composite reliability (ρ_c)	AVE
Concentration (CON)	CON1	0.92	0.91	0.94	0.79
	CON2	0.89			
	CON3	0.90			
	CON4	0.85			
Exploratory behavior (EB)	EB1	0.85	0.85	0.90	0.69
	EB2	0.86			
	EB3	0.85			
	EB4	0.75			
Playfulness (PL)	PL1	0.86	0.93	0.94	0.69
	PL2	0.83			
	PL3	0.75			
	PL4	0.81			
	PL5	0.86			

		PL6	0.84			
		PL7	0.88			
Time distortion (TD)		TD1	0.80	0.81	0.89	0.73
		TD2	0.87			
		TD3	0.88			
Sense of ownership control (SOC)		SOC1	0.73	0.80	0.87	0.63
		SOC2	0.76			
		SOC3	0.86			
		SOC4	0.82			
Autotelic need for touch (AET)		AET1	0.85	0.92	0.94	0.71
		AET2	0.85			
		AET3	0.84			
		AET4	0.80			
		AET5	0.90			
		AET6	0.83			
Vivid memories (VM)	Vividness (VN)	VN1	0.89	0.89	0.93	0.82
		VN2	0.94			
		VN3	0.88			
	Coherence (CN)	CN1	0.88	0.89	0.92	0.75
		CN2	0.87			
		CN3	0.87			
		CN4	0.83			
	Sensory detail (SD)	SD1	0.83	0.85	0.90	0.69
		SD2	0.83			
		SD3	0.83			
		SD4	0.83			
	Emotional intensity (EI)	EI1	0.69	0.88	0.90	0.61
		EI2	0.70			
		EI3	0.68			
		EI4	0.86			
		EI5	0.88			
		EI6	0.86			
	Visual perspective (VP)	VP1	0.86	0.87	0.92	0.79
		VP2	0.91			
		VP3	0.90			

Note: $n = 336$. [a]All of the item loadings were significant at $p < 0.01$.

Subsequently, discriminant validity was examined using a correlation matrix. As listed in Table 3, all the values of the square root of AVE for the measures on the diagonal exceeded the correlations among the measures off the diagonal [Fornell & Larcker 1981]. Thus, the discriminant validity was favorable.

Table 3: Means, standard deviations, correlations, and the square root of the AVE

Construct	Mean	SD	AET	CON	TD	EB	SOC	PL	VM
AET	3.97	.68	**0.84**						
CON	3.74	.68	0.21	**0.89**					
TD	3.53	.74	0.27	0.57	**0.85**				
EB	4.07	.61	0.36	0.54	0.51	**0.83**			
SOC	3.79	.62	0.22	0.50	0.32	0.41	**0.79**		
PL	3.88	.65	0.33	0.74	0.56	0.72	0.52	**0.83**	
VM	3.46	.58	0.14	0.46	0.26	0.43	0.35	0.51	**0.66**

Note: n = 336. Values in the shaded diagonal are the square roots of the AVE. AET = autotelic need for touch; CON = concentration; TD = time distortion; EB = exploratory behavior; SOC = sense of ownership control; PL = playfulness; VM = vivid memories.

4.3 Assessing the Hierarchical Construct in a Structural Model

4.3.1 Direct Effects of Vivid Memory

Figure 4 shows the structural model results omitting the influence of the interacting moderator variables. All of the beta path coefficients were positive (i.e., in the expected direction) and significant ($p < 0.01$). Vivid memories positively influenced concentration (β = 0.47, $p < 0.01$), exploratory behavior (β = 0.43, $p < 0.01$), playfulness (β = 0.52, $p < 0.01$), and time distortion (β = 0.27, $p < 0.01$).

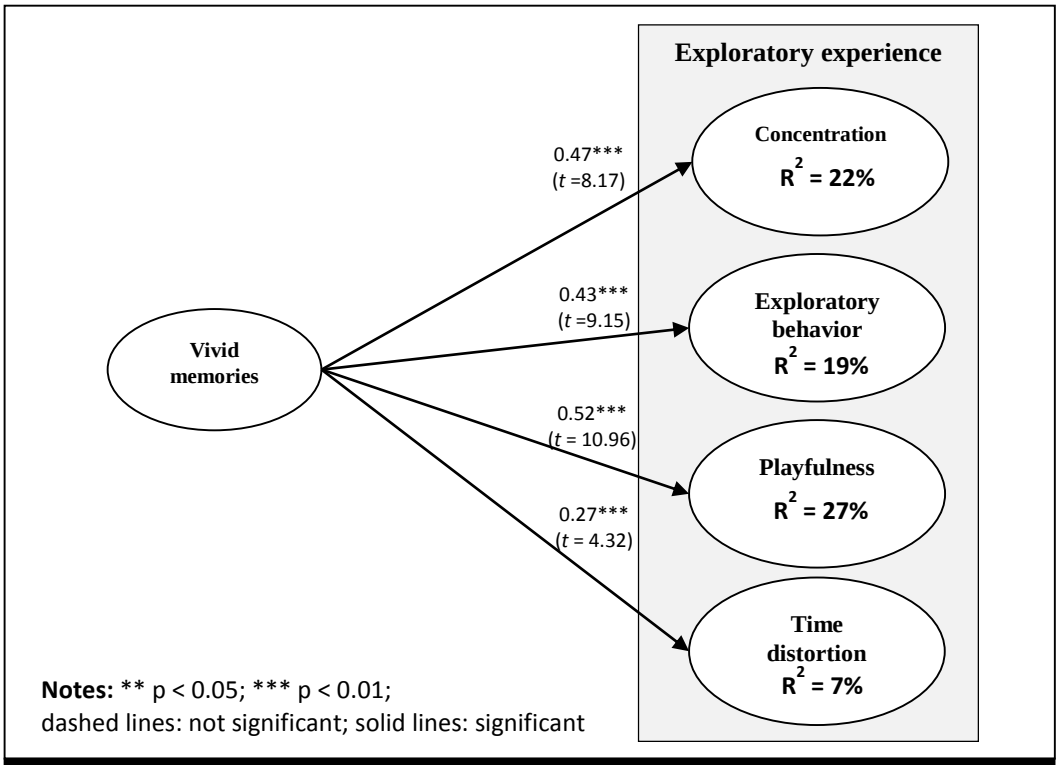

Figure 4: Results for PLS Analysis of the Direct-effect Model without Moderators

4.3.2 Comparing the Online ARIT and Non-ARIT Try-On Environment (Control Group) Models

To determine whether the direct effects of vivid memories and exploratory experience (including concentration, exploratory behavior, playfulness, and time distortion) in an ARIT try-on environment are stronger than those in a non-ARIT try-on environment (control group), the explanatory power of the two competing theoretical models (the

ARIT structural model versus the non-ARIT structural model) were compared using PLS and the R^2 and Chow (F) tests, as suggested by Premkumar and Bhattacherjee [2008].

One hundred and sixty-one valid questionnaires were collected from participants who experienced the non-ARIT try-on environment. The result indicated that the R^2 improvement in concentration (0.22), exploratory behavior (0.19), playfulness (0.27), and time distortion (0.07) in the online ARIT try-on environment model was significantly higher at $p < 0.01$ than that of the online non-ARIT try-on environment model (concentration = 0.04, $F = 32.41$, exploratory behavior = 0.005, $F = 32.18$, playfulness = 0.013, $F = 45.56$, time distortion = 0.01, $F = 10.95$). These results indicated that both the explanatory and predictive power of the online ARIT try-on environment were greater than those of the online non-ARIT try-on environment.

In addition, the results of the invariance of the hypothesized model among the groups revealed statistically significant differences in the path parameter estimates between the online ARIT and non-ARIT try-on environments (Table 4). These results indicated that the PLS analysis of the ARIT structural model was superior to that of the non-ARIT model in the paths between vivid memories and concentration, vivid memories and exploratory behavior, vivid memories and playfulness, and vivid memories and time distortion.

Table 4: The comparsions of various try-on environments

Path parameter estimates	ARIT	Non-ARIT	Difference of T-value
vivid memories → concentration	$\gamma = .47^{***}$	$\gamma = -.19$	6.71^{***}
vivid memories → exploratory behavior	$\gamma = .43^{***}$	$\gamma = .07$	5.21^{***}
vivid memories → playfulness	$\gamma = .52^{***}$	$\gamma = .12$	5.45^{***}
vivid memories → time distortion	$\gamma = .27^{***}$	$\gamma = .10$	1.85^{*}

Note1: ARIT: online augmented reality try-on (n = 336); Non-ARIT: online non-augmented reality try-on (n = 161); *: p < .1; **: p < .05; ***: p < .01

Note2: One hundred sixty one valid questionnaires were collected from the non-ARIT try-on environment. Forty three percent of the respondents were male and 57% were female. In addition, the frequency with which respondents browsed online apparel products differed: respondents browsed multiple times per day (8.6%), once per day (3.4%), once every 3 days (12.1%), once per week (12.1%), once every 2 weeks (12.9%), once per month (9.5%), once every 2 months (14.7%). Furthermore, 85%, and 15% of the respondents spent 2 hours or less and 2-5 hours respectively.

4.3.3 Moderating Effects of Sense of Ownership Control

To model the moderating effects, we conformed to the methods of Chin et al. [1996, 2003]. Moderating terms were formulated by multiplying the corresponding indicators of the predictor and moderator constructs. Furthermore, the hierarchical process recommended by Chin et al. [1996, 2003] was followed for constructing and comparing models with and without the respective moderating constructs. Figure 5 shows the results of the structural model with the moderating effects of sense of ownership control. For the moderator, statistically significant beta path coefficients were indicated. Sense of ownership control was observed to have four moderating effects: a strongly positive moderating effect with vivid memories on concentration ($\beta = 0.23$, $p < 0.01$), exploratory behavior ($\beta = 0.13$, $p < 0.05$), playfulness ($\beta = 0.17$, $p < 0.05$), and time distortion ($\beta = 0.24$, $p < 0.01$).

The strength and direction (i.e., positive) of the main path coefficients cannot be adequately interpreted without considering the influences of the interacting variables. However, by comparison, the direct-effect model explained 22% of the variance in concentration, 19% of the variance in exploratory behavior, 27% of the variance in playfulness, and 7% of the variance in time distortion. By contrast, by including the moderating effects of sense of ownership control, a larger proportion of the variances in concentration ($R^2 = 0.37$), exploratory behavior ($R^2 = 0.27$), playfulness ($R^2 = 0.41$), and time distortion ($R^2 = 0.17$) were considered.

In this study, the Chow test (F test) was conducted for comparing the R^2 values of the direct-effect model with those of the model that included the moderating effects of sense of ownership control. The result indicated that the R^2 improvement in the increasing level of concentration ($R^2 = 0.37$), exploratory behavior ($R^2 = 0.27$), playfulness ($R^2 = 0.41$), and time distortion ($R^2 = 0.17$) in the structural model with the moderating effects of sense of ownership control was significantly higher at $p < 0.01$ than that of the direct-effect model (concentration = 0.22, $F = 22.4$; exploratory behavior = 0.19, $F = 11.43$; playfulness = 0.27, $F = 22.22$; and time distortion= 0.07, $F = 12.5$). These results indicated that both the explanatory and predictive power of the model that included the moderating effects of sense of ownership control were greater than those of the direct-effect model.

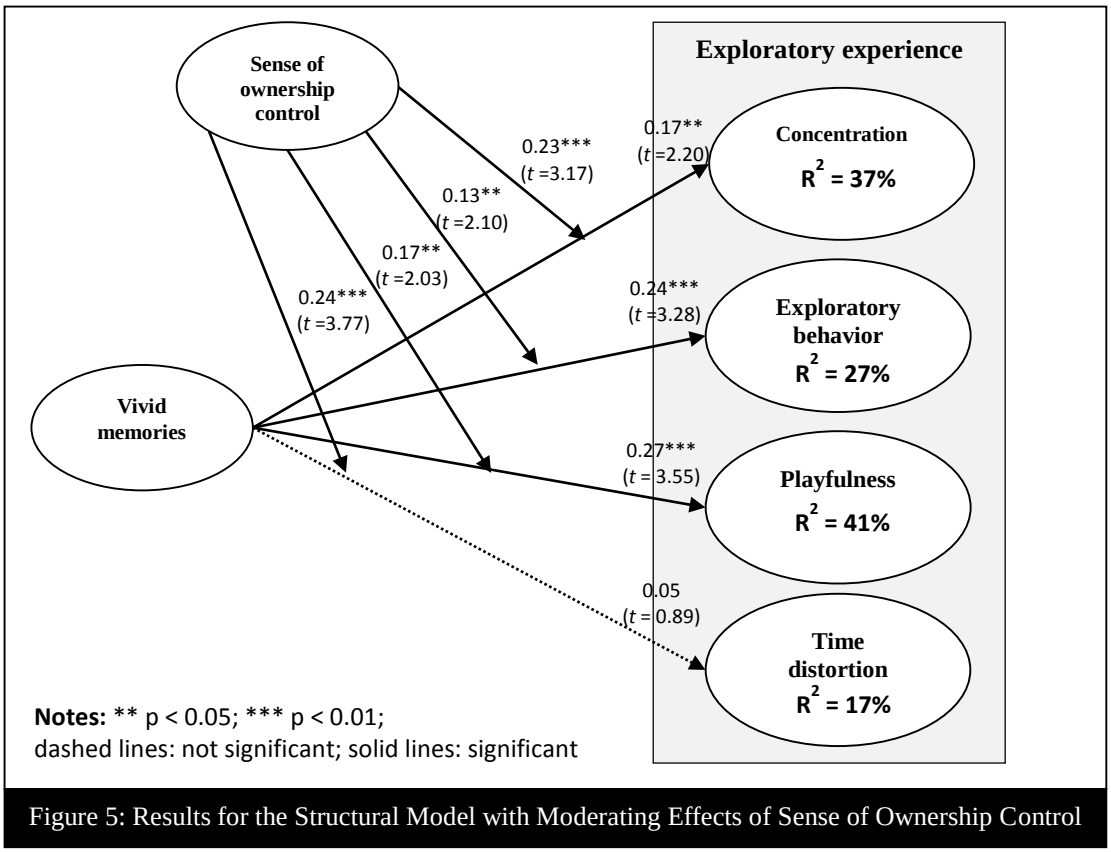

Figure 5: Results for the Structural Model with Moderating Effects of Sense of Ownership Control

4.3.4 Moderating Effects of Autotelic Need for Touch

Figure 6 shows the results of the structural model with the moderating effects of autotelic need for touch. Autotelic need for touch exhibited four moderating effects: a strongly positive moderating effect with vivid memories on concentration (β = 0.16, $p < 0.05$), exploratory behavior (β = 0.20, $p < 0.01$), playfulness (β = 0.17, $p < 0.05$), and time distortion (β = 0.11, $p < 0.05$). By comparison, the direct-effect model explained 22% of the variance in concentration, 19% of the variance in exploratory behavior, 27% of the variance in playfulness, and 7% of the variance in time distortion. By including the moderating effects of autotelic need for touch, a larger proportion of the respective variance in concentration (R^2 = 0.26), exploratory behavior (R^2 = 0.32), playfulness (R^2 = 0.36), and time distortion (R^2 = 0.14) was considered.

In addition, the results of the Chow test (F test) indicated that the R^2 improvement in the increasing level of concentration (R^2 = 0.26), exploratory behavior (R^2 = 0.32), playfulness (R^2 = 0.36), and time distortion (R^2 = 0.14) in the structural model with moderating effects of autotelic need for touch was significantly higher at $p < 0.01$ than that of the direct-effect model (concentration = 0.22, F = 5.97; exploratory behavior = 0.19, F = 18.57; playfulness = 0.27, F = 14.28; time distortion = 0.07, F = 8.75). These results indicated that both the explanatory and predictive power of the model that included the moderating effects of autotelic need for touch were greater than those of the direct only model.

A t test revealed that sense of ownership control significantly affected the degree to which participants experienced self-referencing (t = 4.19, $p < 0.01$). The participants who had a high sense of ownership control (M = 3.66, SD = 0.74) rated themselves higher in self-referencing than did those who had a low sense of ownership control (M = 3.34, SD = 0.64). In addition, autotelic need for touch significantly affected the degree to which the participants experienced self-referencing (t = 4.46, $p < 0.01$). The participants who had a high autotelic need for touch (M = 3.64, SD = 0.72) rated themselves higher in self-referencing than did those who had a low autotelic need for touch (M = 3.29, SD = 0.64). Sense of ownership control and autotelic need for touch, by influencing the self-referencing of the participants, moderated the relationship between vividness memories and exploratory experience.

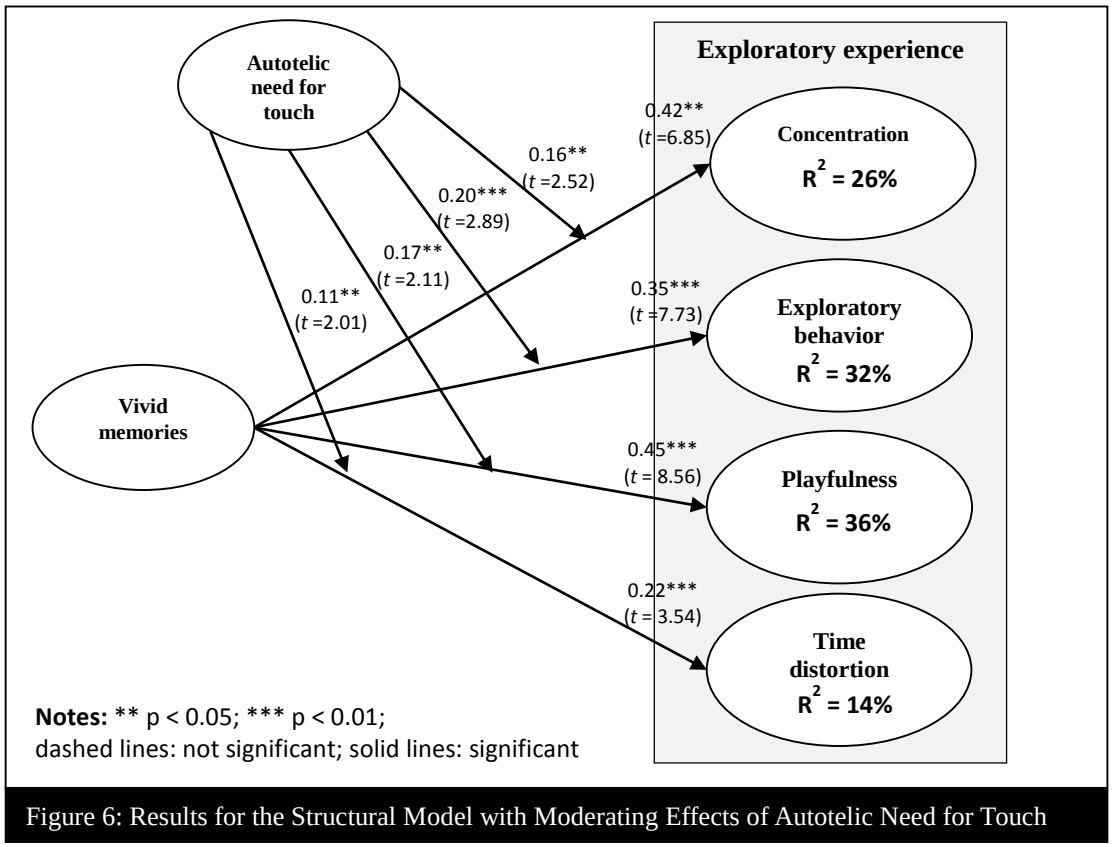

Figure 6: Results for the Structural Model with Moderating Effects of Autotelic Need for Touch

5. Conclusion

5.1 Theoretical Implications

Based on script theory and self-referencing theory, this study proposed and verified a research model. The results of this study have several theoretical implications. First, this study adopted script theory and determined that vivid memories positively influence exploratory consumption experience (i.e., concentration, exploratory behavior, playfulness, and time distortion). The participants exhibited playful and exploratory consumption behavior immediately after ARIT was used to activate their vivid memories. In addition, the participants who possessed highly vivid memories exhibited more apparent playful and exploratory consumption behavior than did the other participants. Therefore, in this study, vivid memories induced subsequent consumption behavior and aided the participants in rapidly immersing themselves in interactive technology consumption activities. The results indicate that during interactive technology consumption activities, vivid memories induce four types of exploratory consumption experience. The results are consistent with the proposal by Erasmus et al. [2002], who suggested applying script theory to investigate consumption behavior. The present study applied the concept of vivid memories to investigate online interactive technology experience according to script theory, thus demonstrating that use of script theory should not be limited to research on physical marketing [e.g., Manthiou et al. 2014].

This study indicates that self-referencing positively influences the activation of consumers' vivid memories and that a strong sense of ownership (e.g., a sense of ownership control during augmented-reality interactive activities) is crucial for producing a strong self-referencing effect. Therefore, a strong sense of ownership helps activate the vivid memories of online consumers and strengthens the relationship between vivid memories and exploratory consumption behavior. The current results provide insight into related studies that have used advertising as a self-referencing context [Kensinger et al. 2006]. In addition, this study inferred that a sense of ownership can produce a strong self-referencing effect in an interactive technology consumption context (e.g., ARIT). Therefore, the results of this study contribute to research on self-referencing.

According to previous studies on interactive augmented reality [e.g., David et al. 2008; Haggard 2005; Kilteni et al. 2012; Sato 2009; Sato & Yasuda 2005; Voss et al. 2010], the expected outcomes of manipulating online artificial bodies must be synchronous with actual outcomes in order for sense of ownership control to be useful in producing a

strong sense of ownership. This viewpoint is consistent with media synchronicity theory; in other words, the synchronous effect of interactive technology substantially influences task-implementation performance [Dennis et al. 2008]. A sense of ownership control has a synchronous characteristic, and a sense of synchronous ownership control is an indispensable factor in producing a substantial self-referencing effect and activating vivid memories. In brief, the results of this study regarding the sense of ownership control substantially contribute to verifying and applying self-referencing theory and media synchronicity theory.

Finally, our study determined that the degree of autotelic need for touch influences the formation of self-referencing and activation of vivid memories. The results of our study supplement the insufficient existing research using the effect of haptic sensation on self-referencing to explore consumption behavior. Consumers with a high autotelic need for touch exhibit effective event schemata and memory structure for processing haptic information. Therefore, when exposed to visual imagery and 3D stimulation that induces a sense of ownership control in an augmented-reality context, such consumers can easily retrieve previous haptic information from their memories to produce a strong self-referencing effect and activate highly vivid memories. In addition, consumers with a high autotelic need for touch use a systematic information-processing method for examining the relationship between new haptic information and their memories and knowledge [Yazdanparast & Spears 2012], thereby enhancing their confidence and expressing a positive attitude toward their consumption decisions. By contrast, consumers with a low autotelic need for touch do not have the event schemata or memory structure necessary for processing haptic information and thus cannot use a high degree of self-referencing to activate vivid memories or explore and experience consumption activities. Such consumers cannot produce a substantial self-referencing effect. In other words, consumers with a higher autotelic need for touch can produce a stronger self-referencing effect and activate their vivid memories to a higher degree. The aforementioned results regarding the autotelic need for touch contribute to research on how consumers process haptic information.

5.2 Managerial Implications

We propose several suggestions for ARIT designers and operators. First, the results of this study can serve as principles for the design of online interactive technology consumption activities. Specifically, the procedures and operations of interactive-technology activities should be designed according to the experience and memories of online consumers. According to the results of this study, ARIT activities successfully evoke the vivid memories of online consumers, thereby aiding the consumers to immerse themselves in interactive activities and introducing them to the enjoyment of ARIT. Our results are consistent with those of previous studies on e-commerce and digital technology [e.g., Djamasbi et al. 2011; Law & Sun 2012; Shin et al. 2012) and have managerial implications. To enable consumers to immerse themselves in a use context, the design of interactive technology should be based on user experience. In addition, according to script theory, ARIT designers must understand the influence of vivid memories on user experience and help users construct memories characterized by time and causal sequences when designing an ARIT interface.

According to our study, vivid memories evoked by augmented reality and characterized by shopping rituals serve as scripts for online consumers to follow and enable consumers to enjoy playful exploratory consumption activities, thereby producing a time-distortion effect. Our results are consistent with those of a report by *Internet Retailer* on why ARIT has a high success rate in converting first-time visitors to online shops into loyal customers. *Internet Retailer* indicated that the conversion rate for online shops that used ARIT was significantly higher than that for online shops that did not use ARIT (57%) [Demery 2010]. Therefore, online shops that seek to use various interactive technologies for attracting customers should not disregard the effect produced by using augmented reality to evoke the vivid memories of online consumers and form an exploratory consumption experience.

The sense of ownership control is a crucial characteristic of ARIT and can reinforce the relationship between vivid memories and exploratory consumption behavior. Hand-eye coordination and synchronization is crucial for producing a sense of ownership control in an augmented-reality context. Therefore, inconsistency between feedback information obtained by manipulating artificial bodies and expected outcomes should be avoided to benefit from the manipulation of the artificial bodies [Voss et al. 2010]. This viewpoint is consistent with media synchronicity theory [Dennis et al. 2008]. In other words, designers of online interactive technology must endeavor to minimize the difference between visual feedback and actual movement or synchronize them to produce a strong sense of ownership control [Kalckert & Ehrsson 2012; Peck et al. 2013] and a substantial self-referencing effect that yields a strong sense of ownership.

Consumers with a high autotelic need for touch can effectively process visual image information provided by augmented reality, and online vendors can use the sense of ownership control induced by 3D augmented reality to help consumers with a high autotelic need for touch try on clothes through ARIT. Accordingly, consumers can experience and explore online activities on the basis of their vivid memories and use a self-referencing mechanism that associates the consumers with products to produce a highly persuasive effect. In addition, because an ARIT

context easily attracts and satisfies consumers with a high autotelic need for touch, online vendors can target and establish relationship with this demographic.

In summary, an online consumption experience in an ARIT context differs from and is superior to that in a traditional virtual reality context. Virtual reality environments (e.g., traditional websites) provide only objective product information, including text and graphics, to help online users passively understand the content of products [Klein 1998]. However, online consumers in ARIT environments can instantly and actively experience products from a first-person perspective. In addition, online consumers in virtual reality environments must use a mouse to click icons to view try-on results [Klein 1998]. ARIT environments create an online try-on experience according to multisensory interactions such as a visual or haptic experience. Consumers' affection and memories from a first-person perspective can thus be stimulated more easily in ARIT contexts than they can be in virtual reality contexts. Moreover, ARIT environments are superior to traditional virtual reality environments in creating an experience of ownership control by enabling users to experience themselves from inside an avatar [Lenggenhager et al. 2009], which moves according to users' intentions [Kilteni et al. 2012]. Furthermore, an online consumption experience in an ARIT environment that shapes a self-referencing experience from a first-person perspective can initiate positive affection and an enjoyable experience as flow [Escalas, 2004], weaken negative judgments of products, and encourage consumers to explore products or brands. In addition, online consumers in ARIT environments can perceive their own bodily movements (e.g., haptic and 3D visual imagery used to simulate the touching of products), which increases consumers' confidence in decision making by improving ownership control [Chark & Muthukrishnan 2013; Kilteni et al. 2012; Song & Kim 2012].

The limitations of our study and suggestions for future research are as follows. This study examined the effects of vivid memories, sense of ownership control, and autotelic need for touch. To establish the causal relationships that vivid memories, sense of ownership control, and autotelic need for touch have with exploratory experience, a task-based laboratory study was conducted. We recommend that future studies focus on actual purchases by consumers. Furthermore, this study examined apparel in an online shopping context because apparel is the fastest-growing product in e-commerce and has the highest sales revenues. Future research should focus on how ARIT influences other online shopping contexts and product types (e.g., computing, communication, and consumer electronic products) to verify and validate the integrated conceptual framework for ARIT proposed in this study. Finally, previous studies have indicated that the elements of vivid memories (i.e., vividness, coherence, sensory detail, emotional intensity, and visual perspective) are causally correlated with one another [e.g., Sutin and Robins 2010]. Therefore, future researchers should conduct additional empirical studies in various contexts to investigate correlations among the elements of vivid memories.

Acknowledgment

The authors would like to thank the Ministry of Science and Technology of the Republic of China, Taiwan, for financially supporting this research under Contract No. MOST 104-2410-H-155-034---and MOST 103-2410-H-155-022-.

REFERENCES

Abelson, R.P., "Psychological Status of the Script Concept," *American Psychologist*, Vol. 36, No. 7:715–729, 1981.

Adval, R. and, R.Jr.S. Wyer, "The Role of Narratives in Consumer Information Processing," *Journal of Consumer Psychology*, Vol. 7, No. 3:207–245, 1998.

Azuma, R.T., "A Survey of Augmented Reality," *Presence-Teleoperators and Virtual Environments*, Vol. 6, No. 4:355–385, 1997.

Balasubramanian, S., R. Raghunathan, and V. Mahajan, "Consumers in A Multiple Channel Environment: Product utility, Process Utility, and Channel Choice," *Journal of Interactive Marketing*, Vol. 19, No. 2:12–30, 2005.

Barclay, D.W., R. Thompson, and C. Higgins, "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adoption and Use an Illustration," *Technology Studies*, Vol. 2, No. 2:285–309, 1995.

Benford, S., C. Greenhalgh, G. Reynard, C. Brown, and B. Koleva, "Understanding and Constructing Shared Spaces with Mixed Reality Boundaries," *ACM Transactions on Computer-Human Interaction*, Vol. 5, No. 3:185–223, 1998.

Bernstein, D.M. and E.F. Loftus, "The Consequences of False Memories for Food Preferences and Choices," *Perspectives on Psychological Science*, Vol. 4:135–139, 2009.

Blanke, O. and T. Metzinger, "Full-Body Illusions and Minimal Phenomenal Selfhood," *Trends in Cognitive Science*, Vol. 13, No. 1:7–13, 2009.

Bower, G.H., J.B. Black, and T.J. Turner, "Scripts in Memory for Text," *Cognitive Psychology*, Vol. 11:177–220, 1979.

Bozinoff, L. and V.J. Roth, "Recognition Memory for Script Activities: An Energy Conservation Application," in A.

Tybout and R. Bagozzi, (Eds), *Advances in Consumer Research*, Vol. 10: 655–660, Association for Consumer Research, Ann Arbor, MI, 1983.

Brakus, J.J., B.H. Schmitt, and L. Zarantonello, "Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty," *Journal of Marketing*, Vol. 73, No. 3:52–68, 2009.

Burnkrant, R.E. and H.R. Unnava, "Effects of Self-Referencing on Persuasion," *Journal of Consumer Research*, Vol. 22, No. 1:17–26, 1995.

Cai, S., X. Wang, and F-K. Chiang, "A Case Study of Augmented Reality Simulation System Application in A Chemistry Course," *Computers in Human Behavior,* Vol. 37(August): 31–40, 2014.

Chark, R. and A.V. Muthukrishnan, "The Effect of Physical Possession on Preference for Product Warranty," *International Journal for Research in Marketing*, Vol. 30, No. 4:424–425, 2013.

Chin, W.W., B.L. Marcolin, and P.R. Newsted, "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from A Monte Carlo Simulation Study and Voice Mail Emotion/ Adoption Study," in: J. I. DeGross, A. Srinivasan, and S. Jarvenpaa (Eds.), in: *Proceedings of the International Conference on Information Systems*, Cleveland, OH, 21–41, 1996.

Chin, W.W., B.L. Marcolin, and P.R. Newsted, "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from A Monte Carlo Simulation Study and An Electronic-Mail Emotion/Adoption Study," *Information Systems Research*, Vol. 14, No. 2:189–217, 2003.

Chou, T.J. and C.C. Ting, "The Role of Flow Experience in Cyber-Game Addiction," *CyberPsychology and Behavior*, Vol. 6:663–675, 2003.

Clotfelter, C.T., "Who Are the Alumni Donors? Giving by Two Generations of Alumni from Selective Colleges," *Nonprofit Management and Leadership*, Vol. 12:119-138, 2001.

Coovert, M., T. Lee, I. Shindev, and Y. Sun, "Spatial Augmented Reality as A Method for A Mobile Robot to Communicate Intended Movement," *Computers in Human Behavior,* Vol. 34:241–248, 2014.

Csikszentmihalyi, M., *Beyond Boredom and Anxiety*, San Francisco: Jossey-Bass, 1975.

Cui, T., H. Ye, and H-H. Teo, "Value Co-Creation with Customers through Design Toolkits: The Importance of Preference Fit and Psychological Ownership," In: *Proceedings of the 19th European Conference on Information Systems* (ECIS 2011), Helsinki, Finland, 2011.

Cunningham, S.J., D.J. Turk, L.M. Macdonald, and C.N. Macrae, "Yours or Mine? Ownership and Memory. *Consciousness and Cognition,* Vol. 17:312–318, 2008.

David, N., A. Newen, and K. Vogeley, "The 'Sense of Agency' and Its Underlying Cognitive and Neural Mechanisms," *Conscious Cognition*, Vol. 17:523–534, 2008.

Debevec, K. and E. Iyer, "Self-Referencing as A Mediator of the Effectiveness of Sex-Role Portrayals in Advertising," *Psychology and Marketing*, Vol.5 (Spring):71–84, 1988.

Debevec, K. and J.B. Romeo, "Self-Referent Processing in Perceptions of Verbal and Visual Commercial Information," *Journal of Consumer Psychology,* Vol. 1, No. 1:83-102, 1992.

Demangeot, C. and A.J. Broderick, "The Role of Exploration in Creating Online Shopping Value," *Advances in Consumer Research*, Vol. 36:473–481, 2009.

Demery, P.," A Virtual Model Cinches Higher Conversions at Retailer Hawes & Curtis," *Internet Retailer,* July 1, 2010, Available at: http://www.internetretailer.com/2010/07/01/virtual-model-cinches-higher-conversions-retailer-hawes-c

Dennis, A.R., R.M. Fuller, and J.S. Valacich, "Media, Tasks, and Communication Processes: A Theory of Media Synchronicity," *MIS Quarterly,* Vol. 32, No. 3:575–600, 2008.

Djamasbi, S., M. Siegel, J. Skorinko, and T. Tullis, "Online Viewing and Aesthetic Preferences of Generation Y and Baby Boomers: Testing User Web Site Experience through Eye Tracking," *International Journal of Electronic Commerce*, Vol. 15, No. 4: 21–158, 2011.

Dube´, L. and K. Menon, "Multiple Roles of Consumption Emotions in Post-Purchase Satisfaction with Extended Service Transactions," *International Journal of Service Industry Management*, Vol. 11, No. 3:287–304, 2000.

eMarketer, "Apparel Drives US Retail Ecommerce Sales Growth," 2012. Available at: http://www.emarketer.com/newsroom/index.php/apparel-drives-retail-ecommerce-sales-growth.

Escalas, J.E. "Image Yourself in the Product: Mental Simulation, Narrative Transportation, and Persuasion," *Journal of Advertising*, Vol. 33, No. 2:37–48, 2004.

Erasmus, A.C., E. Boshoff, and G. Rousseau, "The Potential of Using Script Theory in Consumer Behavior Research," *Journal of Family Ecology and Consumer Sciences*, Vol. 30:1–9, 2002.

Fogg, B.J., *Persuasive Technology: Using Computers to Change What We Think and Do*, Kaufmann Publishers, San Francisco, CA, 2003.

Fornell, C. and D.F. Larcker, "Evaluating Structural Equations with Unobservable Variables and Measure Error.

Journal of Marketing Research, Vol. 18, No. 2:39–50, 1981.

Garrett, J.J., *The Elements of User Experience: User-Centered Design for the Web and Beyond*, Second Edition, New Riders, 2011. (Available at http://sophia.javeriana.edu.co/~cbustaca/HCI_2014_01/documentos/ 2011_Garrett_ The%20Elements% 20of%20User%20Experience%20User-Centered%20Design%20 for%20the%20Web%20and%20Beyond.pdf.)

Ghani, J.A., R. Supnick, and P. Rooney, "The Experience of Flow in Computer-Mediated and in Face-to-Face Groups," *Proceedings of the Twelfth International Conference on Information Systems*, 229–237, 1991. New York: ICIS.

Ghani, A.J. and P.S. Deshpande, "Task Characteristics and the Experience of Optimal Flow in Human-Computer Interaction," *Journal of Psychology*, Vol. 128, No. 4:381–391, 1994.

Greenberg, D.L. and D.C. Rubin, "The Neuropsychology of Autobiographical Memory," *Cortex*, Vol. 39:687–728, 2003.

Haggard, P., "Conscious Intention and Motor Cognition," *Trends Cognition Science*, Vol. 9:290–295, 2005.

Hair, J.F., C.M. Ringle, and M. Sarstedt, "PLS-SEM: Indeed a Silver Bullet," *Journal of Marketing Theory and Practice*, Vol. 18, No. 2:139–152, 2011.

Hair, J.F., G.T. M. Hult, C.M. Ringle, and M. Sarstedt, *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Sage, Thousand Oaks, 2013.

Harrison, W.B., S.K. Mitchell, and S.P. Peterson, "Alumni Donations and Colleges' Development Expenditures: Does Spending Matter?" *American Journal of Economics and Sociology*, Vol. 54:397–412, 1995.

Hoffman, D.L. and T.P. Novak, "Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations," *Journal of Marketing*, Vol. 60:50–68, 1996.

Holbrook, M.B. and E.C. Hirschman, "The Experiential Aspects of Consumption: Consumer Fantasy, Feelings and Fun," *Journal of Consumer Research*, Vol. 9, No. 2:132–140, 1982.

Kalckert, A. and H.H. Ehrsson, "Moving A Rubber Hand That Feels Like Your Own: A Dissociation of Ownership and Agency," *Frontiers in Human Neuroscience*, Vol. 6, No. 40, 2012. Available at: doi: 10.3389/fnhum.2012.00040.

Kaplan, S., "Environmental Preference in A Knowledge-Seeking, Knowledge-Using Organism," In J. Tooby (Ed.), *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, New York: Oxford University Press, 581–598, 1992.

Karimov, F.P., M. Brengman, and L.V. Hove, "The Effect of Website Design Dimensions on Initial Trust: A Synthesis of the Empirical Literature," *Journal of Electronic Commerce Research*, Vol. 12, No. 4:272-301, 2011.

Keng, C-J., V-D Tran, T-H.Liao, C-J. Yao, and M.K. Hsu, "Sequential Combination of Consumer Experiences and Their Impact on Product Knowledge and Brand Attitude: The Moderating Role of Desire for Unique Consumer Products," *Internet Research*, Vol. 24, No. 3:270–291, 2014

Kensinger, E.A., R.J. Garoff-Eaton, and D.L. Schacter, "Memory for Specific Visual Details Can Be Enhanced by Negative Arousing Content," *Journal of Memory and Language*, Vol. 54:99–112, 2006.

Kilteni, K., R. Groten, and M. Slater, "The Sense of Embodiment in Virtual Reality," *Presence: Teleoperators and Virtual Environments*, Vol. 21, No. 4:373–387, 2012.

Kim, J-H., "Determining the Factors Affecting the Memorable Nature of Travel Experiences," *Journal of Travel and Tourism Marketing*, Vol. 27, No. 8:780–796, 2010.

Klein, L.R., "Evaluating the potential of interactive media through a new lens: Search versus experience goods," *Journal of Business Research*, Vol. 41, No. 3:195–203, 1998.

Kuwabara, K.J. and D.B. Pillemer, "Memories of Past Episodes Shape Current Intentions and Decisions," *Memory*, Vol. 18: 365–374, 2010.

Law, E.L-C and X. Sun, "Evaluating User Experience of Adaptive Digital Educational Games with Activity Theory," *International Journal of Human-Computer Studies*, Vol. 70, No. 7:478–497, 2012.

Leigh, T.W. and A.J. Rethans, "Experiences with Script Elicitation within Consumer Decision-Making Contexts," *Advances in Consumer Research*, Vol. 10:667–672, 1983. Thirteenth Annual Conference. San Francisco. Association for Consumer Research.

Lenggenhager, B., M. outhon, and O. Blanke, "Spatial aspects of bodily self-consciousness," *Consciousness and Cognition*, Vol. 18, No. 1:110–117, 2009 (doi:10.1016/j.concog. 2008.11.003).

Libby, L.K. and R. P. Eibach, "Looking Back in Time: Self-Concept Change Affects Visual Perspective in Autobiographical Memory," *Journal of Personality and Social Psychology*, Vol. 82:167–179, 2002.

Mathieu, J–P. and L. Marco, "Cognitive Segmentation Based on Product-Usage Representation," *Universal Journal of Management and Social Sciences*, Vol. 4, No. 4:1–21, 2014.

Manthiou, A., S. Lee, L. Tang, and L. Chiang, "The Experience Economy Approach to Festival Marketing: Vivid Memory and Attendee Loyalty," *Journal of Service Marketing*, Vol. 28, No. 1:22–35, 2014.

Martin, I., "Expert Novice Differences in Complaint Scripts," *Advances in Consumer Research*, Vol. 18:225–231, 1991. Twenty first Annual Conference. Association for Consumer Research.

Mathwick, C., N.K. Malhotra, and E. Rigdon, "Experiential Value: Conceptualization, Measurement and Application in the Catalog and Internet Shopping Environment," *Journal of Retailing*, Vol. 77, No. 1:39–56, 2001.

Merle, A., S. Sénécal, and A. St-Onge, "Whether and How Virtual Try-On Influences Consumer Responses to An Apparel Web Site," *International Journal of Electronic Commerce*, Vol. 16, No. 3:41–64, 2012.

Nel, D., R. van Niekerk, J. Berthon, and T. Davies, "Going with the Flow: Web Sites and Customer Involvement," *Internet Research: Electronic Networking Applications and Policy*, Vol. 9, No. 2:109–116, 1999.

Nottenburg, G. and E.J. Shoben, "Scripts as Linear Orders," *Journal of Experimental Social Psychology*, Vol. 16: 329–347, 1980.

Novak, T.P., D.L. Hoffman, and Y.F. Yung, "Measuring the Customer Experience in Online Environments: A Structural Modeling Approach," *Marketing Science*, Vol. 19, No. 1: 22–42, 2000.

Novak, T.P., D.L. Hoffman, and A. Duhachek, "The Influence of Goal-Directed and Experiential Activities on Online Flow Experiences," *Journal of Consumer Psychology*, Vol. 13, No. 1&2: 3–16, 2003.

Nunnally, J.C., *Psychometric Theory*, 2nd Ed. New York: McGraw Hill, 1978.

Olsson, T., E. Lagerstam, T. Kärkkäinen, and K. Väänänen-Vainio-Mattila, "Expected User Experience of Mobile Augmented Reality Services: A User Study in the Context of Shopping Centres," *Personal and Ubiquitous Computing*, Vol. 17, No. 2: 287-304, 2013.

Peck, J. and T.L. Childers, "Individual Differences in Haptic Information Processing: The 'Need for Touch' Scale," *Journal of Consumer Research*, Vol. 30: 430–442, 2003a.

Peck, J. and T.L. Childers, "To Have and to Hold: The Influence of Haptic Information on Product Judgments," *Journal of Marketing*, Vol. 67:35–48, 2003b.

Peck, J. and J.W. Johnson, "Autotelic Need for Touch, Haptics and Persuasion: The Role of Involvement," *Psychology & Marketing*, Vol. 28, No. 3:222–239, 2011.

Peck, J., V. Barger, and A. Webb, "In Search of A Surrogate for Touch: The Effect of Haptic Imagery on Perceived Ownership," *Journal of Consumer Psychology*, Vol. 23, No. 2:189–196, 2013.

Petty, R.E. and J.T. Cacioppo, *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*, New York: Springer-Verlag, 1986.

Pillemer, D.B., *Momentous Events, Vivid Memories*, Cambridge, MA: Harvard University Press, 1998.

Pillemer, D.B., "Directive Functions of Autobiographical Memory: The Guiding Power of the Specific Episode," *Memory*, Vol. 11:193–202, 2003.

Prahalad, C.K. and V. Ramaswamy, "Co-Creation Experiences: The Next practice in Value Creation," *Journal of Interactive Marketing*, Vol. 18, No. 3:5–14, 2004.

Premkumar, G., and A. Bhattacherjee, "Explaining information technology usage: a test of competing models," *Omega*, Vol. 36, No. 1:64–75, 2008.

Puto, C.P., "Memory for Scripts in Advertisements," *Advances in Consumer Research*, Vol. 12: 404–409, 1985. Fifteenth Annual Conference. Association for Consumer Research.

Quigley, C.J.Jr., F.G. Jr. Bingham, and K.B. Murray, "An Analysis of the Impact of Acknowledgement Programs on Alumni Giving," *Journal of Marketing Theory and Practice*, Vol. 10:75-87, 2002.

Ringle C.M., S. Wende, and A. Will, *SmartPLS 2.0 M3*, University of Hamburg, Hamburg, Germany, 2007, available at: http://www.smartpls.de.

Ringle, C.M., M. Sarstedt, and D.W. Straub, "A Critical Look at the Use of PLS-SEM in MIS Quarterly," *MIS Quarterly*, Vol. 36, No. 1: iii–xiv, 2012.

Roediger, H.L. III. and N. Amir, "Implicit Memory Tasks: Retention without Conscious Recollection," In A. Wenzel and D. C. Rubin (Eds.), *Cognitive Methods and Their Application to Clinical Research*, Washington, DC: American Psychological Association, 121-151, 2005.

Rubin, D. and M. Kozin, "Vivid Memories," *Cognition*, Vol. 16, No. 1:81–95, 1984.

Rubin, D. C., R.W. Schrauf, and D.L. Greenberg, "Belief and Recollection of Autobiographical Memories," *Memory and Cognition*, Vol. 31, No. 6:887–901, 2003.

Sato, A. and A. Yasuda, "Illusion of Sense of Self-Agency: Discrepancy between the Predicted and Actual Sensory Consequences of Actions Modulates the Sense of Self-Agency, but not the Sense of Self-Ownership," *Cognition*, Vol. 94, No. 3:241–255, 2005.

Sato, A., "Both Motor Prediction and Conceptual Congruency between Preview and Action-Effect Contribute to Explicit Judgment of Agency," *Cognition*, Vol.110:74–83, 2009.

Sautter, P., M.R. Hyman, and V. Lukošius, "E-Tail Atmospherics: A Critique of the Literature and Model Extension," *Journal of Electronic Commerce Research*, Vol. 5, No. 1:14-24, 2004.

Segovia, K.Y. and J.N. Bailenson, "Virtually True: Children's Acquisition of False Memories in Virtual Reality," *Media Psychology,* Vol. 12, No. 4:371–393, 2009.

Serbun, S.J., J.Y. Shih, and A.H. Gutchess, "Memory for Details with Self-Referencing," *Memory,* Vol. 19, No. 8:1004–1014, 2011.

Shin, D.H., J. Jung, and B.H. Chang, "The Psychology behind QR Codes: User Experience Perspective," *Computers in Human Behavior,* Vol. 28, No. 4:1417–1426, 2012.

Singer, J.A. and P. Salovey, *The Remembered Self: Emotion and Memory in Personality*, New York: The Free Press, 1993.

Skadberg, Y.X. and J.R. Kimmel, "Visitors' Flow Experience While Browsing a Web Site: Its Measurement, Contributing Factors, and Consequences," *Computers in Human Behavior,* Vol. 20:403–422, 2004.

Song, S.S. and M. Kim, "Does More Mean Better? An Examination of Visual Product Presentation in E-retailing," *Journal of Electronic Commerce Research*, Vol. 13, No. 4:345-355, 2012.

Spence, C. and A. Gallace, "Multisensory Design: Reaching Out to Touch the Consumer," *Psychology and Marketing,* Vol. 28, No. 3:267–308, 2011.

Stoltman, J.J, S.R. Tapp, and R.S. Lapidus, "An Examination of Shopping Scripts," *Advances in Consumer Research,* Vol.16:384–391, 1989. Nineteenth Annual Conference. Association for Consumer Research.

Suengas, A.G. and M.K. Johnson, "Qualitative Effects of Rehearsal on Memories for Perceived and Imagined Complex Events," *Journal of Experimental Psychology: General*, Vol.117:377–389, 1988.

Suntornpithug, N. and J. Khamalah, "Machine and Person Interactivity: The Driving Forces behind Influences on Consumers' Willingness to Purchase Online," *Journal of Electronic Commerce Research*, Vol. 11, No. 4:299-325, 2010.

Sutherland, S., *The Macmillan Dictionary of Psychology*, New York. Macmillan, 1995.

Sutin, A. R. and R. W. Robins, "Phenomenology of Autobiographical Memories: The Memory Experiences Questionnaire," *Memory,* Vol. 15, No. 4:390–411, 2007.

Sutin, A.R. and R.W. Robins, "Correlates and Phenomenology of First and Third Person Memories," *Memory,* Vol. 18, No. 6:625–637, 2010.

Symons, C.S. and B.T. Johnson, "The Self-Reference Effect in Memory: A Meta-Analysis," *Psychological Bulletin,* Vol. 121:371–394, 1997.

Takatalo, J., T. Kawai, J. Kaistinen, G. Nyman, and J. Häkkinen, "User Experience in 3D Stereoscopic Games," *Media Psychology,* Vol. 14, No. 4:387–414, 2011.

Tang, A., F. Biocca, and L. Lim, "Comparing Differences in Presence During Social Interaction in Augmented Reality versus Virtual Reality Environments: An Exploratory Study," In *Proceedings of Presence*, Seventh Annual International Workshop on Presence, Valencia, Spain, 204–207, 2004.

Taylor, S.A., J.J.Jr. Cronin, and R. S. Hansen, "Schema and Script Theory in ChannelsResearch," *Marketing Theory and Applications*, American Marketing Association Winter's Conference, No.2:15–24, 1991.

Teo, H.H., K.K. Wei, and I. Benbasat, "Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective," *MIS Quarterly*, Vol. 27, No. 1:19–49, 2003.

Thompson, C.P., J.J. Skowronski, S.F. Larsen, and A. Betz, *Autobiographical Memory: Remembering What and Remembering When*, Hillsdale, NJ: Lawrence Erlbaum Associates, Inc., 1996.

Tomkins, S.S., *Script Theory: Differential Magnification of Affects,* University of Nebraska Press, Lincoln, NE., 1978.

Trevino, L.K., and J. Webster, "Flow in Computer-Mediated Communication: Electronic Mail and Voice Mail Evaluation and Impacts," *Communication Research*, Vol. 19, No. 5:539–573, 1992.

Tung, V.S. and J.B. Ritchie, "Investigating the Memorable Experiences of the Senior Travel Market: An Examination of the Reminiscence Bump," *Journal of Travel and Tourism Marketing*, Vol. 8, No. 3:331–343, 2011.

van Krevelen, D.W. F. and R. Poelma, "A survey of Augmented Reality Technologies, Applications and Limitations," *The International Journal of Virtual Reality*, Vol. 9, No. 2:1–20, 2010.

Voss, M., J. Moore, M. Hauser, J. Gallinat, A. Heinz, and P. Haggard, "Altered Awareness of Action in Schizophrenia: A Specific Deficit in Predicting Action Consequences," *Brain*, Vol. 133:3104–3112, 2010.

Webster, J., K.L. Trevino, and L. Ryan, "The Dimensionality and Correlates of Flow in Human-Computer Interactions," *Computers in Human Behavior,* Vol. 9, No. 4:411–426, 1993.

Whitney, J.C. and G. John, "An Experimental Investigation of Intrusion Errors in Memory for Script Narratives," *Advances in Consumer Research*, Vol. 10:661–666, 1983. Thirteenth Annual Conference. San Francisco. Association for Consumer Research.

Yazdanparast, A. and N. Spears, "Need for Touch and Information Processing Strategies: An Empirical Examination," *Journal of Consumer Behaviour,* Vol. 11:415–421, 2012 (doi: 10.1002/cb.1393).

Appendix I. Measurement scales			
Construct		**Items**	
Concentration (CON)		CON1	I was completely immersed in the experience of using the system to try on clothes.
		CON2	I was completely involved in the process of using the system to try on clothes.
		CON3	I highly concentrated on the experience of using the system to try on clothes.
		CON4	During the entire process of using the system to try on clothes, I completely focused my attention on the activity.
Exploratory behavior (EB)		EB1	The clothes-fitting experience stimulated my curiosity.
		EB2	The clothes-fitting experience made me feel as if I were exploring a new world.
		EB3	The clothes-fitting activity afforded me a diverse experience.
		EB4	I wish to use the system to try on various types of clothing.
Playfulness (PL)		PL1	I feel that the clothes-fitting experience was enjoyable.
		PL2	I felt excited by the clothes-fitting experience.
		PL3	I felt satisfied with the clothes-fitting experience.
		PL4	The clothes-fitting experience evoked my imagination.
		PL5	The clothes-fitting experience was entertaining.
		PL6	The clothes-fitting experience was interesting.
		PL7	I extremely enjoyed the clothes-fitting experience.
Time distortion (TD)		TD1	I felt that the time passed very quickly while I was trying on clothes.
		TD2	I did not pay attention to time while I was trying on clothes.
		TD3	I forgot about time while I was trying on clothes.
Sense of ownership control (SOC)		SOC1	I felt that I could control the body on the screen.
		SOC2	I could control the hands on the screen as I wished.
		SOC3	I could freely adjust the body and limbs on the screen.
		SOC4	I could easily adjust the body and limbs on the screen.
Autotelic need for touch (AET)		AET1	While I was shopping, I could not help touching various products.
		AET2	Touching various products is interesting.
		AET3	Touching various products is crucial to me when I am browsing shops.
		AET4	Even if I do not intend on purchasing a product, I still like to touch it.
		AET5	I like to touch various products when I am browsing.
		AET6	I found that I often touch various products in stores.
Vivid memories (VM)	Vividness (VN)	VN1	I do not remember the process of using the system to try on clothes.
		VN2	My memory of the process of using the system to try on clothes is vague.
		VN3	I do not clearly remember the details of the process of using the system to try on clothes.
	Coherence (CN)	CN1	My memory of the event sequence for the process of using the system to try on clothes is confusing.
		CN2	My memory of the process of using the system to try on clothes is fragmented and is not coherent.
		CN3	The process of using the system to try on clothes was not imprinted in my memory and is mingled with other events in my memory.
		CN4	Coherently recalling the process of using the system to try on clothes is extremely difficult.
	Sensory detail	SD1	When recalling the process of using the system to try on clothes, I cannot experience my feeling at that time.

	(SD)	SD2	When recalling the process of using the system to try on clothes, I cannot re-experience my feeling of the operation process.
		SD3	My memory of the operation process does not contain much sensory information, such as visual and tactile information.
		SD4	I cannot recall my sensory experience of the process of using the system to try on clothes, such as my feeling of trying on clothes or touching clothes.
	Emotional intensity (EI)	EI1	My feeling is strong when recalling the clothes-fitting process.
		EI2	My emotion is intense when recalling the entire operation process.
		EI3	My memory of the clothes-fitting process can provoke strong feelings.
		EI4	I do not remember any strong feelings induced during the entire clothes-fitting process.
		EI5	I do not have a strong feeling of the entire clothes-fitting process.
		EI6	My memory of the clothes-fitting process cannot provoke strong emotions or feelings.
	Visual perspective (VP)	VP1	When recalling the clothes-fitting process, I appear to be an observer instead of a leading character.
		VP2	When recalling the clothes-fitting experience, I felt as if I were someone else and the feeling was not real.
		VP3	When recalling the clothes-fitting process, I felt that I retrospected the process from a third-person perspective.