This is to certify that the
dissertation entitled

A DUAL PROCESSING MODEL OF VIRTUAL EXPERIENCE

presented by

Ki-Young Lee

has been accepted towards fulfillment
of the requirements for the

Ph.D. degree in Media and Information Studies

Major Professor's Signature

5/9/2006

Date

DATE DUE	DATE DUE	DATE DUE
02509 NOV 17 2007	08017	
02/25/09		
AUG 24 2008 07108		

A DUAL PROCESSING MODEL OF VIRTUAL EXPERIENCE

By

Ki-Young Lee

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Advertising

2006

ABSTRACT

A DUAL PROCESSING MODEL OF VIRTUAL EXPERIENCE

By

Ki-Young Lee

This study proposed and tested a dual-processing model of virtual experience in which discursive processing and experiential processing modes constitute two distinct routes of virtual experience as they relate to attitude accessibility and attitude confidence. It also examined the boundary condition in which each processing mode is more likely to operate, by specifying product type (utilitarian *vs.* hedonic) as a possible moderator for relations between the two processing modes and attitude accessibility, and attitude confidence. A two-factor mixed experiment (N = 227) was conducted, with presentation mode as the between-subject factor (2-D or 3-D) and product type (utilitarian or hedonic) as the within-subject factor. Data were analyzed using ANOVA, ANCOVA, and latent variable structural equation modeling (SEM). The results of SEM analyses suggest that, as expected, the two processing modes mediated the effects of virtual experience, as simulated in 3-D product visualization, to attitude accessibility and attitude confidence. Also the relative influence of each processing mode on attitude accessibility and attitude confidence was found to be affected by product type. However, decomposition of significant effects suggests that regardless of product type, experiential processing played a dominant role in differences observed in the two dimensions of brand attitude strength. The results are discussed in light of research on interactive advertising and consumer information processing.

ACKNOWLEDGMENTS

I am greatly indebted to those who made this dissertation possible.

I thank Dr. Hairong Li, my advisor, for his direction, unflinching support, keen insight and hard work, all of which inspired me – and in no small way enabled me – to complete this project. I also thank my fabulous committee members, Drs. Frederick Fico, Frank Biocca, and Steven M. Edwards, for their investment of time, energy and guidance in this project, and for giving me the opportunity to work with them during my time at Michigan State University. I will always remember fondly these fine experiences.

My special thanks go to Young-Seock Cha for his technical assistance. He willingly sacrificed his valuable time to develop reaction time programs, without which this dissertation would still be far from completion. I also thank my friends in both Korea and the United States, and my MSU colleagues, for their friendship and support during my study.

This dissertation would not have been made possible without the love, support, and understanding of my wife, Sung-Hee Joo. I cannot find good words to express how thankful I am to her, who has always been there for me as a wonderful critic, colleague, and source of everyday happiness.

Finally, I dedicate this dissertation to my parents, Jin-Ho and Suk-Sang Lee, for all their encouragement and countless prayers over the years. I cannot thank them enough for their love and sacrifices for me.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1. Introduction

Virtual experience is an emerging concept in consumer psychology and e-commerce. Prior research indicates that virtual product interactions, as simulated in three-dimensional (3-D) product visualization, lead to increased product knowledge, more favorable brand attitude, and stronger purchase intention than does indirect product experience via traditional two-dimensional (2-D) online presentations (Edwards and Gangadharbatla 2001; Li, Daugherty, and Biocca 2001; Li, Daugherty, and Biocca 2002, 2003; Schlosser 2003). Virtual experience resembles direct experience with respect to interactivity and vividness, and these shared properties are believed to account for the effectiveness of virtual experience (Li, Daugherty, and Biocca 2001).

Research on virtual experience until now has focused on traditional measures of advertising effectiveness such as brand attitude and purchase intention in response to virtual product interactions. Considering similarities between virtual and direct experience, however, these standard valence attitude measures may not be able to detect some of other subtle, yet important changes accompanying virtual experience. Although a recent study suggests that virtual experience can influence attitude-behavior consistency by fostering the formation of accessible and confident brand attitude (Lee and Li 2005), evidently more research is needed to add robustness of this finding. Moreover, no research has been conducted yet to account fully for the psychological processes of virtual experience as it relates to these two dimensions of attitude strength. Thus, we do not know yet how virtual experience actually shapes strong brand attitude.

In explicating the psychological processes of virtual experience, research on the

concept of experiential processing to persuasive communication (e.g., advertising) is relevant. The "experiential processing" view emphasizes the role of mental imagery, sensory pleasures, daydreams, fantasies, and emotional responses for persuasion (Hirschmann and Holbrook 1982; Holbrook and Hirschmann 1982; MacInnis and Price 1987; Meyers-Levy and Malaviya 1999), and is contrasted with the "discursive processing" view focusing on verbal encoding/retrieval, cognitive responding, and rational/analytical processing for persuasion (Ajzen and Fishbein 1980; Bettman 1979; Greenwald 1968; MacInnis and Price 1987; Olson, Toy, and Dover 1982). When this experiential processing strategy operates, judgments are not based on thoughts or cognitive elaborations generated in response to message content *per se* but rather on sensations or feelings prompted by the very act of processing (Meyers-Levy and Malaviya 1999; Strack 1992). Research indicates that interactive and well-designed Internet user interfaces, 3-D product simulations in particular, are able to create an enjoyable shopping episode via simulating a sensory and emotional experience of direct product encounter (Li, Daugherty, and Biocca 2001; Schlosser 2003). This finding suggests the experiential view may be relevant to the study of virtual experience, and needs to be incorporated for a better understanding of what can be accomplished by this phenomenon.

To date, however, discussion on the merit of virtual experience is limited, often, to its non-experiential aspects such as elaborated processing, learning, efficiency of information acquisition and decision-making (Ariely 2000; Haubl and Trifts 2000; Hoque and Lohse 1999; Tremayne and Dunwoody 2001), failing to acknowledge the experiential benefits it may offer. In contrast, other studies have been devoted

predominantly to exploration of the probable experiential ramifications of virtual experience such as flow, escapism, immersion, and imagery (Hoffman, Novak, and Duhachek 2003; Mathwick and Rigdon 2004; Novak, Hoffman, and Yung 2000), ignoring non-experiential aspects of virtual experience.

Although these studies offer valuable insight into factors and processes related to virtual experience, what seems needed is an integrated framework organizing and combining the various theories and findings, and a delineation of the boundary conditions in which each is likely to operate. The central goal of this dissertation is to develop such a framework. In brief, this dissertation proposes a dual processing model of virtual experience in which discursive processing and experiential processing constitute two distinct routes of virtual experience as it relates to the strength of brand attitude. Given the distinct roles theses two processing modes may play in online consumer behaviors (Hoffman, Novak, and Duhachek 2003; Schlosser 2003), research on virtual experience is reasoned to benefit from simultaneously taking them into account. By incorporating these perspectives together into the existing virtual experience literature, the explanatory power of such an integrated model in explicating online consumer behavior is expected to improve.

In addition, this dissertation attempts to explore the conditions in which each processing mode is likely to function, by proposing and testing product type as a moderator. Specifically, the proposed model posits that the relative size of the effect of each processing mode on the strength of brand attitude (attitude accessibility and attitude confidence) is influenced by whether the product being examined is perceived as primarily utilitarian or as primarily hedonic.

This dissertation is aimed to answer the following three questions.

i) Does virtual experience lead to the formation of strong brand attitude with respect to attitude accessibility and attitude confidence?

ii) Do both discursive processing and experiential processing of virtual experience contribute to the strength of brand attitude?

iii) If both processing modes contribute to attitude strength, then what factors would determine the relative influence of each mode in shaping attitude strength? More specifically, will the nature of a product of interest (e.g., utilitarian or hedonic) play a significant role in deciding which of the two modes ensues, and mediate the effect?

This dissertation is divided into six chapters. Chapter 1 introduces the phenomena to be examined. It provides an overview of the dissertation and its intended contribution. Chapter 2 reviews the research on direct, indirect, and virtual experience in regard to their impact on attitude accessibility and attitude confidence. In Chapter 2, the research on discursive and experiential processing modes is also reviewed in their relations to the distinction between utilitarian and hedonic products. Based on the review of literature, Chapter 3 proposes an integrated framework of virtual experience and discusses the research hypotheses derived from it. Chapter 4 describes the methodology to be used to test the research hypotheses, along with a description of the scales that are used in the

empirical data collection. Chapter 5 reports the results of statistical analyses for hypotheses testing. The proposed research model is examined in terms of its psychometric properties and hypothesized causal relationships using confirmatory factor analysis and structural equation modeling. Chapter 6 presents discussions on the research findings presented in Chapter 5. Theoretical and practical implications, as well as limitations of the present study are also discussed. An exploration of future study directions concludes this dissertation.

Chapter 2. Literature Review

2.1. Direct, Indirect, and Virtual Experience

The classification of direct, indirect, and virtual experience is primarily based on the degree of possible interaction between consumer and product, and the intensity of sensory engagement involved in such interactions (Li, Daugherty, and Biocca 2001). Direct experience involves the interaction of a product with the consumer's full sensory capacity, including visual, auditory, taste-smell, tactile, haptic, and orienting (e.g., trial, sampling, or use of products; Gibson 1966), whereas indirect experience stems from a secondhand, mediated exposure to the product, for example, via word of mouth communication, TV commercials, print ads, or two-dimensional Internet ads.

Research on direct/indirect experience on consumer behavior suggests that direct product experience is generally superior to advertising for persuasion (Marks and Kamins 1988; Smith and Swinyard 1982, 1983, 1988). In particular, the information integration model (Smith and Swinyard 1982) predicts that when consumers directly experience the product, they tend to develop strong (higher order) beliefs and attitudes, which culminate in higher attitude-behavior consistency. Advertising usually elicits weak (lower order) beliefs, attitudes, and conations because the tendency to accept the presented information is low. The information integration model has been refined by Wright and Lynch (1995) and Kempt and Smith (1998), whose work suggests direct experience should be superior in conveying experience attributes, whereas advertising should be superior in conveying search attributes. Of particular importance to this dissertation is the finding that strong attitudes are generated by direct experience. Specifically, direct experience has been

shown to positively relate to attitude accessibility (Doll and Ajzen 1992; Fazio et al. 1982) and attitude confidence (Fazio and Zanna 1978a, 1978b; Smith and Swinyard 1982, 1983; Wu and Shaffer 1987).

Virtual experience is formally defined as "psychological and emotional states that consumers undergo while interacting with products in a 3-D environment" (Li, Daugherty, and Biocca 2001, p. 14). Virtual experience possesses certain properties of direct experience, including interactivity and vividness (Li, Daugherty, and Biocca 2001), yet it remains a mediated experience (Heeter 2000) that can be provided to larger audience (Edwards and Gangadharbatla 2001). Virtual experience, therefore, may be able to enjoy the advantages of both direct and indirect experience (Edwards and Gangadharbatla 2001; Li, Daugherty, and Biocca 2001).

Research indicates that virtual experience has positive effect on consumer learning, brand attitude, and purchase intention (Coyle and Thorson 2001; Edwards and Gangadharbatla 2001; Griffith and Chen 2004; Li, Daugherty, and Biocca 2002, 2003; Schlosser 2003). The effectiveness of virtual experience stems from its ability to simulate consumers' first-hand evaluations of product claims. Virtual experience resembles direct experience in that consumers interact with 3-D products and real products similarly as far as visual input is concerned, which is quite different from the passive absorption of information from traditional advertising (Li, Daugherty, and Biocca 2001). The effect of virtual experience, however, appears qualified by the extent to which experiential attributes can be manifested and thus conveyed online. Griffith and Chen (2004), for example, report that virtual experience is more effective than online advertising based on text information alone for products with fully digitizable attributes. However, its

effectiveness is restricted to affect and product evaluations for products of which attributes cannot be fully manifested online (e.g., apparel). Behavioral measures are not affected by virtual experiences which can not adequately convey products' experiential attributes. The relative effectiveness of virtual experience also appears affected by the online-shopper's goal (searching *vs.* browsing) and individual difference in imagery ability (Schlosser 2003) and expertise (Griffith and Chen 2004).

2.2. Virtual Experience and Attitude Strength

This dissertation assumes that an interactive and vivid 3-D mode leads to stronger attitudes than a static and pallid 2-D mode, largely due to the similarities between direct and virtual experience. Thus, more relevant studies are those that document the effect of 3-D visualization on non-evaluative dimensions of attitudes such as attitude intensity (Klein 2003) and decision quality (Li, Daugherty, and Biocca 2003). These studies suggest that standard valence/evaluative measures of attitudes (e.g., brand attitude, purchase intention) may be inadequate for capturing the effect of 3-D product visualization and therefore non-evaluative attitude dimensions should be measured for a full grasp of what can be accomplished by 3-D product visualization.

The need for incorporating non-evaluative dimensions of attitudes can be further justified by the fact that people do not always behave in accordance with their evaluative dimensions of attitudes. The adoption of evaluative/valence attitude measures as indicators of advertising effectiveness has been a common practice in advertising and consumer behavior literature. The popularity of this approach derives from the implicit assumption that these valence attitude measures are good predictors of actual behavior.

However, empirical evidence regarding the attitude-behavior relationship shows that, although such a link is generally positive, in many situations the strength of the association is rather weak (Fazio et al. 1982; Fazio and Zanna 1981; Smith and Swinyard 1983; Wicker 1969).

Responding to the lack of consistency in the attitude-behavior relationship, some researchers proposed and empirically identified non-evaluative dimensions of attitudes as moderators of the attitude-behavior relationship (Fazio and Zanna 1981; Zanna and Fazio 1982). These include attitude extremity, attitude ambivalence, affective-cognitive consistency, attitude accessibility, and attitude confidence/certainty (Krosnick et al. 1993; Krosnick and Petty 1995). Indeed, these non-evaluative dimensions of attitudes comprise the concept of attitude strength. Attitude strength has been defined as "a latent psychological construct that is presumably represented in memory by various attributes of the attitude" (Krosnick and Petty 1995, p. 3). The concept of attitude strength rests on the premise that attitudes with equivalent extremity (either positive or negative) can differ as to their underlying strength, and these differences in attitude strength moderate the extent to which attitudes influence subsequent information processing and behavior (Fazio 1995). In fact, research on attitudes has demonstrated that some attitudes are more firmly internalized and consequential, i.e., *strong*, whereas others are more flexible and less influential, i.e., *weak*, on one's thought and action (Krosnick et al. 1993; Raden 1985). More specifically, attitudes are deemed strong when they are persistent over time, resist change, have strong influence on information processing and judgments, and strongly predict behavior (Haugtvedt and Priester 1997; Krosnick and Petty 1995).

Of several attitude strength variables, attitude accessibility and attitude confidence

are of primary interest largely due to their positive relationship with direct experience (Fazio and Zanna 1981; Smith and Swinyard 1983). Research on these constructs also implies that they are influenced by various advertising techniques, such as repeated advertising and comparative advertising (Berger and Mitchell 1989; Yi, Phelps, and Roskos-Ewoldsen 1998). Thus, aided by virtual experience technologies, it may be feasible for advertisers to foster consumers' attitude accessibility and attitude confidence.

2.3. Attitude Accessibility and Attitude Confidence

Attitude accessibility refers to the ease or quickness with which an attitude is retrieved from memory. Fazio (1986) defines attitudes as a learned association in memory between an attitude object and one's evaluation of the object. Attitude accessibility indicates the strength of this object-evaluation association. In Fazio's accessibility theory (1986), behavior is posited to be a function of one's perceptions of the attitude object in the immediate situation in which the object is encountered. A highly accessible attitude from memory is likely to be activated automatically upon the individual's encounter with the object (Fazio et al. 1986). Once activated, the attitude serves to filter or bias the individual's immediate perceptions of the object and the situation (Fazio and Williams 1986; Houston and Fazio 1989) and thereby 'guides' subsequent behavior regarding the object. In contrast, when the attitude is not readily accessible from memory, immediate perceptions are less likely to be influenced by any previously formed evaluation toward the object. Instead, these immediate perceptions tend to be based on other momentarily salient features of the object and the situation that are not necessarily consistent with the preexisting attitude. As a result, higher attitude-behavior consistency is more pronounced

when attitudes are highly accessible than when attitudes are relatively inaccessible.

Considerable empirical support for this proposition has been found in the literature of consumer behavior (Berger and Mitchell 1989; Fazio, Powell, and Williams 1989; Priester et al. 2004) and social psychology (Bassili 1993; Fazio et al. 1982; Fazio and Williams 1986; Millar and Millar 1996). Typically, the activation potential of attitudes in memory, namely attitude accessibility, is operationalized as *the latency of response to an attitudinal inquiry* (Fazio 1986, 1990). Presumably, the speed at which people respond to attitudinal inquiries reflects the likelihood of automatic activation of attitudes upon their encountering the object.

Attitude accessibility and attitude confidence appear to be related, but they are psychologically distinct constructs with different antecedents (Berger 1992; Berger and Mitchell 1989). In the social psychology literature, attitude confidence has been defined as the degree to which an individual is certain that his or her attitude toward an object is correct, and it is usually measured by self-report of certainty or confidence (Krosnick and Schuman 1988). Although people are motivated to hold correct attitudes (Petty and Cacioppo 1996), they vary in the extent of their confidence in the correctness of attitudes. In the consumer behavior literature, attitude confidence has been defined as the buyer's subjective feeling of "certainty," "accuracy," or "sense of feeling sure" in making a judgment of the quality of a particular brand (Berger 1992; Howard 1989; Howard and Sheth 1969). This definition appears to reflect two different theoretical dimensions of attitude confidence. It may refer to the buyer's overall confidence in the brands. Alternatively, it may refer to the buyer's confidence in his or her ability to judge or evaluate attributes of the brands (Bennett and Harrell 1975). In this study, attitude

confidence is defined as *the consumer's subjective belief that his or her evaluation of a product presented online is accurate.*

As with attitude accessibility, attitude confidence has been proposed as a moderator in the attitude-behavior relationship. Prior research shows attitudes held with greater confidence are more predictive of subsequent behavior than attitudes with weak confidence (Berger and Mitchell 1989; Fazio and Zanna 1978a, 1978b; Smith and Swinyard 1983). Attitude confidence is also believed to provide some indication of the degree of resistance an attitude enjoys in the face of counter-attitudinal attack: an attitude held with a higher degree of confidence is less vulnerable to a counterattack aimed to change it (Fazio, Powell, and Herr 1983; Fazio and Zanna 1981).

2.4. Discursive and Experiential Processing

Research on information processing to persuasive communication (e.g., advertising) has traditionally focused on discursive processing[1] (MacInnis and Price 1987). Researchers of discursive processing regard individuals as logical information processors in arriving at a decision (Bettman 1979), and are usually interested in "how *symbols* (e.g., words and numbers) are combined in a working memory and represented to solve the problem" (MacInnis and Price 1987, p. 473). Accordingly, researchers in this tradition have emphasized the role of verbal encoding/retrieval, cognitive responding, and rational and analytical scrutiny of information as important mediators for persuasion

[1] In this dissertation, the term, "discursive processing" does not refer to a particular information processing model. Rather, the term is used as a generic label that subsumes many of cognitively based information processing models in persuasion, including multiattribute attitude model (Fishbein and Azjen 1975), cognitive response model (Greenwald 1968; Olson, Toy, and Dover 1982; Wright 1973, 1980), the dual processing models such as the ELM (Petty and Cacioppo 1981, 1986) and the HSM (Chaiken (1980).

(Bettman 1979; Greenwald 1968; MacInnis and Price 1987; Olson, Toy, and Dover 1982; Wright 1973, 1980).

Discursive processing assumes that when an individual is exposed to a persuasive message, it is not the message itself that is important, but rather *thoughts*, *ideas*, *cognitive responses* to the message that mediate persuasion (Brock and Shavitt 1983). In the context of advertising, when consumers attend to an ad for brand evaluation purpose, they often attempt to 'bridge' or 'connect' the information in the ad to related, preexisting knowledge that they have about the product advertised and its product category (Krugman 1965). For example, they may retrieve from memory previously stored criteria normally employed for evaluating alternatives within the category and apply the criteria for assessing the ad's information. They also may respond to the ad with elaborated cognitive responding such as counterargument and support argument, resulting in agreement or disagreement with the ad's propositions (Petty and Cacioppo 1986). These cognitive activities can be described on an elaboration continuum. At the low end of the continuum are simple responses such as the retrieval of a verbal label of an object. Toward the high end of the continuum are more complex responses such as counterarguments, support arguments, source derogations, and attributions (Bone and Ellen 1992; MacInnis and Price 1987; Wright 1980).

In sum, when discursive processing strategy operates, persuasion is thought to be a function of consumers' reflections on, and cognitive responses about, the presented message (Greenwald 1968; Wright 1980). As a result, attitude formation and change are contingent on the net favorableness of the cognitive responses that occurred during exposure to the message (Cacioppo and Petty 1979; Kisielius and Sternthal 1984, 1986):

when the elaboration is favorable, a positive attitude change is expected, whereas when the elaboration is unfavorable, an attitude is adversely affected.

It should be noted that discursive processing postulates that messages can be conveyed in the form of both text (e.g., ad copy) and visual (e.g., pictures and images). Although much research on discursive processing in advertising and consumer behavior has focused on consumers' cognitive responses in response to ad copy (e.g., Olson, Toy, and Dover 1982), semantic, reasoned cognitive activities also can be evoked from pictures and images of the ad through their ability to imply verbal information (Mitchell and Olson 1981; Rossiter and Percy 1980). In addition, in the context of this study, the term cognitive responses is used in a rather limited manner in which it refers to only *thoughts and inferences related to the product being presented online*. Although cognitive responses have been defined broadly as any thoughts and inferences that arise during exposure to a persuasive communication (Meyers-Levy and Malaviya 1999; Olson, Toy, and Dover 1982), prior research indicates that the extent of issue- or topic-relevant elaboration is directly responsible for the development of strong attitudes and attitudinally consistent behavior (Haugtvedt and Priester 1997; Petty, Haugtvedt, and Smith 1995). By the same logic, the extent of product-relevant elaborated thoughts that emerge during exposure to a stimulus web site will be associated more closely with the formation of strong brand attitudes than will other product-irrelevant thoughts that may emerge concurrently.

Experiential processing emphasizes the role of experiential components of responses to a persuasive communication, including mental imagery, sensory experiences, daydreams, fantasies, and emotional responses (Hirschmann and Holbrook 1982;

Holbrook and Hirschmann 1982; MacInnis and Price 1987; Meyers-Levy and Malaviya 1999). Researchers following this tradition, therefore, have offered the possibility that persuasion may be mediated by sensations or feelings that emerge during the very act of processing rather than by cognitive responses to available information (Meyers-Levy and Malaviya 1999; Stract 1992).

In the experiential view, the concept of mental imagery assumes a central role. Mental imagery has been defined as a form of information processing that invokes perceptions and sensory experiences in working memory (Baddeley 1986), and is "a conceptually distinct process of representing information, a way that is 'very like picturing and very unlike describing' (MacInnis and Price 1987, p. 473)." When consumers are exposed to an ad, they not only process its messages in a semantic, reasoned analytical manner, but may respond to it by creating mental images about their potential behaviors in an imagined scenario in which they are the main characters (Escalas 2004; MacInnis and Price 1987). For example, when a consumer sees a red Ford Mustang in a TV commercial, he or she not only perceives and encodes multi-sensory information from the commercial (e.g., visuals, sounds), but also may react to them by generating multi-sensory images within himself or herself. He or she may imagine himself or herself behind the wheel of the red Mustang, driving along a beautiful beach road on a sunny day, feeling the breeze rustling his or her hair, all of which are also "experienced" (Hirschmann and Holbrook 1982).

When mental imagery operates, it leads to persuasion via reduced negative cognitive responding, realism of experience, and associated emotional responses (Green and Brock 2000). This way of processing information via mental imagery represents a

processing that is qualitatively different from discursive processing in which logical consideration is critical for persuasion and thus is unrelated to cognitive elaboration (Escalas 2004; Green and Brock 2000; Schlosser 2003). As with discursive processing, mental imagery can be described also on an elaboration continuum, which ranges from simple retrieval of a fleeting, simple image of an object to very rich and engrossing 'real' experiences induced by fantasies, daydreams, and visual problem solving (Bone and Ellen 1992; Holbrook and Hirschmann 1982; MacInnis and Price 1987).

Mental imagery has several qualities that fundamentally distinguish it from discursive processing. First, mental imagery implies *mental transportation into a virtual world created in a consumer's mind* (Green and Brock 2000). Especially, when mental imagery operates in the form of 'mental simulation' (Taylor and Schneider 1989) or 'role-taking' (MacInnis and Jaworski 1989) with hypothetical scenarios and stories, it is possible for consumers to be completely immersed into their self-generated stories that captivate their attention and imagination. In narrative transportation literature, this phenomenon is referred to as "immersion into a text" or "lost in a story" (Gerrig 1994; Green and Brock 2000). Second, mental imagery can be multi-sensory in nature (Bone and Ellen 1992; MacInnis and Price 1987). Although prior research on mental imagery has mainly focused on visual imagery (i.e., generation of mental pictures of objects or situations), mental imagery can incorporate a combination of different sensory dimensions such as taste, smell, sight, and tactile sensations. In contrast, discursive processing stresses semantic and cognitive processing, which are only remotely related to sensory experiences.

Finally, mental imagery is intimately associated with affective responses and emotions (Bone and Ellen 1992; MacInnis and Price 1987; Sheikh and Jordan 1983), especially when the imagery involves the self (Taylor and Schneider 1989). In contrast, discursive processing is relatively affect-free. Mental imagery shares the same physiological mechanism with perception (sensation) and is thus able to produce a broad range of physiological responses such as muscular reactions, heart rate, eye movements, which reflect actual perceptual processes (Lang 1979; MacInnis and Price 1987). These physiological responses are typically accompanied by emotions such as pleasure, negative feelings, and arousal. Once evoked, these emotions are further to be related to attitudes toward the ad and brand (Sheikh and Jordan 1983). Specifically, greater imagery is shown to be associated with stronger emotions and affective responses to the ad and the brand (Bone and Ellen 1992).

Although mental imagery is a multidimensional concept, encompassing vividness, quantity, ease, and ability to manipulate images (see Bone and Ellen 1982 for a review), this study focuses on vividness of mental imagery. Vividness of imagery appears most relevant in virtual experience studies (Schlosser 2003). Specifically, in this study, the vividness of a mental image is defined as *the degree of clarity of an imagined episode*.

2.5. Utilitarian and Hedonic Product Types

One of the main goals of the present study is to specify some boundary conditions in which each of discursive and experiential processing modes is likely to operate. In this regard, the idea of classifying products as being either utilitarian or hedonic is useful as it is inherently related to the conceptualizations of the two processing modes.

Prior research indicates that products can be distinguished based on whether the primary purpose associated with the consumption of the product is utilitarian/functional or hedonic/experiential (Batra and Ahtola 1990; Hirschmann and Holbrook 1982; Mano and Oliver 1993). Generally speaking, utilitarian products refer to goods whose purpose of consumption is mainly instrumental and goal-oriented and accomplishes a functional and practical task (e.g., toothpaste, cereal, detergent, laptop computer), whereas hedonic products refer to goods whose purpose of consumption lies mainly in an sensory and experiential experience of fun, pleasure, and excitement (e.g., movie, ballet, vacation resort, painting) (Dhar and Wertenbroch 2000; Hirschmann and Holbrook 1982). Accordingly, for a utilitarian product brand selection is primarily determined by the consumer's overall assessment about the functional utility of tangible product attributes. In contrast, for a hedonic product a key determinant of brand selection is the consumer's anticipation about how well (the consumption of) the product will serve to satisfy his or her emotional wants (Batra and Ahtola 1990; Hirschmann and Holbrook 1982). Although the consumption of a product may involve both dimensions (Batra and Ahtola 1990), products can be easily arrayed on a functional-experiential continuum (Batra and Ahtola 1990; Batra and Ray 1985; Hirschmann and Holbrook 1982; MacInnis and Jaworski 1989; MacInnis and Price 1987). As a result, it is possible that consumers can characterize some products as primarily utilitarian and others primarily hedonic (Dhar and Wertenbroch 2000).

Chapter 3. Proposed Research Model and Hypotheses

3.1. Integrated Model of Virtual Experience

The main thesis of this dissertation is that discursive processing and experiential processing constitute two distinct processing modes of virtual experience relating to the formation of strong brand attitudes – accessible and confident brand attitudes, and that both of these processing modes can be united in a general theoretical framework of virtual experience – a dual processing model of virtual experience. Considering the distinct roles these two processing modes may play in online consumer behaviors (Novak, Hoffman, and Duhachek 2003; Schlosser 2003), the explanatory power of such an integrated model in explaining online consumer experiences is expected to improve. Specifically, in the dual processing model, cognitive elaboration is posited to represent the discursive processing aspect, whereas mental imagery and imagery-evoked emotions represent the experiential components of virtual experience.

The proposition of discursive and experiential processes as two distinct routes of virtual experience does not necessarily imply that they should occur in a mutually exclusive manner. Rather, I suggest, consumers can experience both simultaneously. The integration of discursive and experiential processes in this manner is compatible with the premise that cognition and affect are parallel but integrated parts of human mental framework (Epstein 1994; MacInnis and Price 1987; Zajonc 1968). Likewise, cognitive elaboration, and mental imagery and imagery-evoked emotions are different but integral parts of virtual experience, and the relation between these components is analogous to that of cognition and affect in general.

Although theoretically interesting, integrating discursive and experiential processing modes in a single framework is a methodologically difficult task since the two processing modes might be intertwined in their effects on processing outcomes (MacInnis and Price 1987). For example, it can be argued that a consumer may envision an image and give it a verbal label or engage in elaborated cognitive responses based on an imagined episode (MacInnis and Price 1987). If this happens, it makes the disentanglement of the unique effects of each mode on processing outcomes challenging. Not entirely dispelling this possibility, however, this research maintains that discursive and experiential processing modes represent two "qualitatively" different processing modes, and that their effects on attitude formation may be separable (Escalas 2004; Green and Brock 2000; Schlosser 2003).

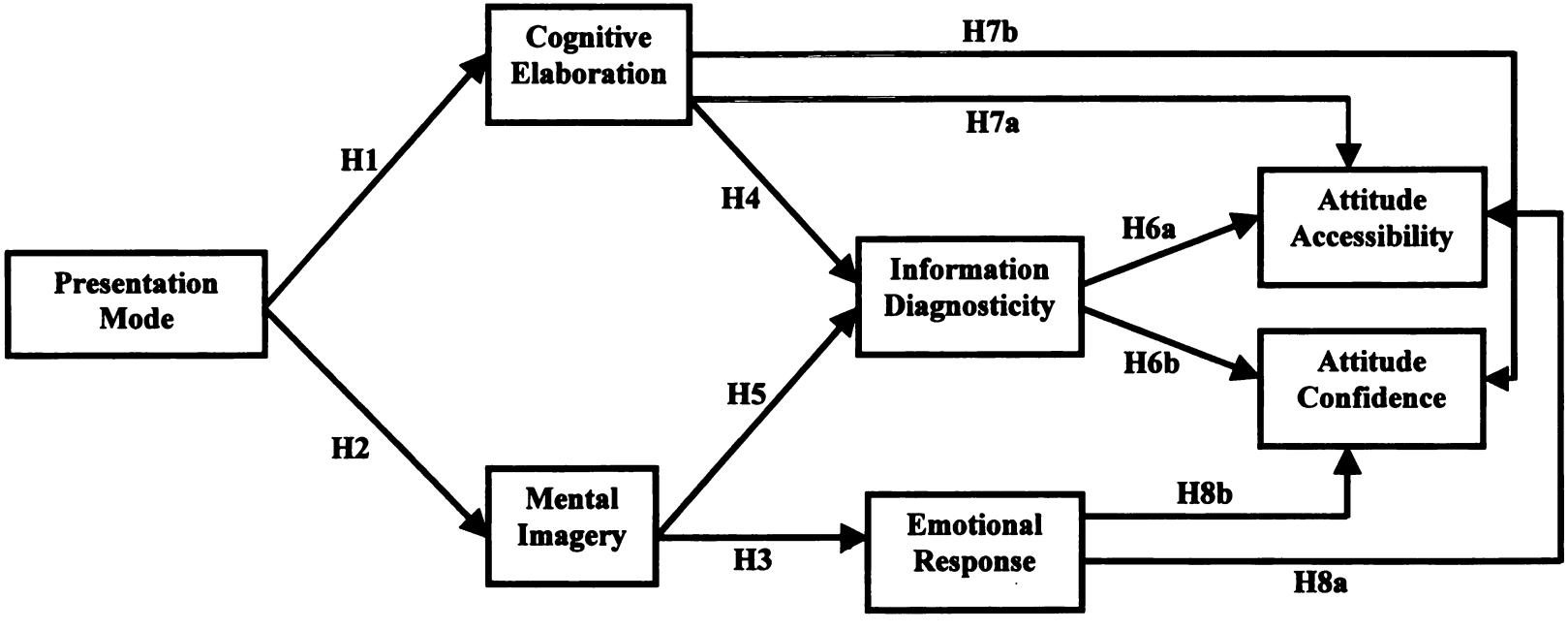
Figure 1 describes the proposed research model. Specifically, the model posits cognitive elaboration and imagery-evoked emotions have a direct and separate effect on the two dimensions of attitude strength, attitude accessibility and confidence. At the same time, the model also allows for cognitive elaboration and mental imagery to affect the two attitude strength dimensions indirectly via their joint influence on the perceived diagnostic value of product information. The latter hypotheses can be thought of reflecting the possibility of the two processing modes being intertwined on their effects on processing outcomes.

In addition, this study attempts to shed light on some boundary conditions in which each processing mode is likely to operate, by specifying product type as a possible moderator for the relations between the two processing modes and attitude strength. In doing so, an idea of classifying products as being either utilitarian or hedonic is

introduced as it is inherently related to the conceptualizations of discursive and experiential processing. In essence, the dual processing model posits that the relative contribution of discursive and experiential processing modes to attitude strength is affected by the nature of a product in question. Specifically, the relative contribution of the discursive processing on attitude accessibility and attitude confidence will be more prominent for utilitarian products, whose goal of consumption is mainly functional and goal-driven than for hedonic products, whose goal of consumption is mainly for enjoyment and arousal. On the other hand, the relative contribution of the experiential processing on attitude accessibility and attitude confidence will become more prominent for hedonic products than for utilitarian products. The final two sets of hypotheses deal with the moderating roles of utilitarian *vs.* hedonic product type for the relationships between cognitive elaboration and attitude strength (H7a & H7b) and between imagery-evoked emotion and attitude strength (H8a & H8b).

It is worth noting that in the proposed research model attitude accessibility and attitude confidence are represented as two distinct constructs, rather than as alternative dimensions of an overarching latent construct that can be labeled attitude strength (i.e., as two first-order dimensions of attitude strength). Conceptually, they can be thought of as two manifestations of attitude strength. However, existing empirical evidence does not support a single factor structure encompassing these dimensions (Krosnick et al. 1993). In addition, given the clear distinctions between accessibility and confidence in terms of definitions and operationalizations, combining these constructs into a single second-order factor appears counterproductive. Consequently, attitude accessibility and attitude confidence are treated as two separate constructs in this study.

Figure1. Proposed Research Model – Dual Processing Model of Virtual Experience



3.2. Hypotheses

Each path in the proposed research model (Figure 1) constitutes research hypotheses of this dissertation. The following section describes theoretical rationale and supporting empirical evidence for each hypothesis.

3.2.1. Cognitive Elaboration as Response to Virtual Experience

Interactivity and vividness, two key characteristics of virtual experience, are assumed to contribute jointly to the degree of cognitive elaboration consumers engage in for 3-D products. First, the direct manipulation of virtual products using 3-D features is expected to enhance consumers' cognitive elaboration of the product presented because it requires them to think about how to interact with the product properly. Furthermore, interactive 3-D features allow for control over the flow of information to gather information relevant to users' unique informational needs and interest (Ariely 2000). An online shopper for a laptop computer, for example, is able to examine the laptop at different angles, zoom in and out for close inspection, and even try for different colors for the laptop's lid to see what it looks like prior to purchase. The important point for this interaction is that these visual and behavioral simulations are conducted at a pace and in a sequence of the consumer's own choice. As a result, each individual consumer is able to receive his or her own unique combination of messages and experiences (Sundar and Kim 2005). This added opportunity for customizing information flow and acquisition appears to facilitate the consumer's elaboration of the product-relevant information. In support of this view, an individual's ability to control the pace at which the information is

delivered has been found to increase the likelihood of elaborative cognitive processing (Chaiken and Eagly 1983; Krugman 1965).

Being different from a comparatively pallid 2-D product presentation, the vividness of a 3-D product presentation is also likely to induce consumers to engage in product-relevant cognitive elaboration with richer information cues (Kisielius and Sternthal 1984, 1986). Kisielius and Sternthal (1984, 1986), for example, have shown that vivid information affects the degree to which consumers will engage in cognitive elaboration of the product advertised, which in turn mediates judgmental attitudes. According to their availability-valence hypothesis, vividly presented information evokes cognitive elaboration that may either enhance or undermine the persuasiveness of a message, depending on the relative favorableness of the thoughts elaborated.

There is direct empirical support for this proposition. Li, Daugherty, and Biocca (2001) have found that when interacting with 3-D products, participants tend to produce more product-relevant thoughts than when interacting with 2-D products. In fact, this active cognitive process found in the 3-D condition is one of the most consistent findings witnessed by participants exposed to 3-D products (Li, Daugherty, and Biocca 2003).

Given the above discussion and findings, this dissertation predicts that virtual experience created by 3-D online environments leads to greater cognitive elaboration of the product presented as compared to static 2-D presentations. The following hypothesis reflects this proposition.

H1: Participants exposed to products in the 3-D condition will engage in more product-relevant cognitive responding than those exposed to products in the 2-D condition.

3.2.2. Mental Imagery and Emotion as Responses to Virtual Experience

The interactive nature of 3-D product presentations is expected to lead to more vivid mental imagery of product use, compared to static 2-D presentations online (Schlosser 2003). One of the most fundamental features that distinguishes 3-D presentations from traditional 2-D presentations is their ability to directly manipulate virtual products (Li, Daugherty, and Biocca 2001). With direct manipulation, there is an immediate and constant change of graphics reflecting user behaviors, which resembles physical actions (Schlosser 2003). What is implied in this interaction is that the computer system is capable of giving feedbacks in response to the actions users perform on the computer, resulting in a sense of "as if" responding – "responding as if the events were occurring in the physical world (Schlosser 2003, p. 185)." According to Schlosser (2003), it is this "as if" responding that blurs the boundary between virtual and physical reality (Biocca 1992) and causes users to be immersed into an imaginative world where they are being transported as participants (Green and Brock 2000). This whole process can be captured properly by the term, mental imagery. Especially, when mental imagery occurs in the form of 'mental simulation' (Taylor and Schneider 1989) with hypothetical scenarios and stories, it is possible for users to be immersed completely into their self-generated stories that captivate their attention and imagination.

In line with this reasoning, direct exploration of virtual products using 3-D features is expected to stimulate mental imagery of product use. With interactive 3-D features, consumers are able to move, rotate, zoom in and out, and customize virtual products, and each of these direct manipulation capabilities of 3-D interface appears contributive to the creation of more vivid mental images of product use.

The vivid product descriptions of 3-D interface also facilitate mental imagery by enhancing the realism of the experience. Vividness as a media characteristic is defined as "the representational richness of a mediated environment as defined by its formal features; that is, the way in which an environment presents information to the senses" (Steuer 1992), and consists of two dimensions – *sensory breadth,* representing the number of sensory dimensions simultaneously a medium can appeal to, and *sensory depth,* representing the depth or quality of information a medium can provide to the senses. Although current 3-D technologies are limited in their capacity to simulate tactile and olfactory sensations (Biocca 1992; Li, Daugherty, and Biocca 2001), 3-D presentations of products are still capable of appealing to sight via vivid visual and behavioral simulations, and this is more powerful than pallid 2-D presentations. This appealing to sight may then foster vicarious experience of product use by bringing consumers closer to a more realistic environment that imitates real experience. In line with this assumption, Edwards and La Ferle (2003) suggest that appealing to sight using the various images and textures associated with the product presented online will enhance the believability of the virtual experience, thus helping consumers imagine themselves using the product.

Given the above discussion and findings, this study predicts that virtual experience created by 3-D online environments leads to more vivid[2] mental images of product use than do static 2-D presentations. The following hypothesis reflects this proposition.

---

[2] Vividness of mental imagery refers to the clarity of mental images and is the participant's response to the stimuli. In this regard, it differs vividness as an inherent characteristic of the media interface.

H2: Participants exposed to products in the 3-D condition will have more vivid mental imagery of product use than those exposed to products in the 2-D condition.

Mental imagery of having and using a product should involve a sensory and emotional experience, which in turn leads to the generation of strong judgments about the product. Prior research indicates that mental imagery evoked by stimuli can be affect-laden (Lang 1979; MacInnis and Price 1987; Sheikh and Jordan 1983), especially when the imagery involves the self (Taylor and Schneider 1989). Mental imagery shares the same physiological mechanism with actual sensation, thus is able to produce a broad range of physiological responses such as muscular reactions, heart rate, eye movements, which reflect actual perceptual processes (Lang 1979; MacInnis and Price 1987). Specifically, it is expected that vivid and elaborated imagery of product use to be associated with stronger emotional responses than dull and less-elaborated imagery. Evidently, fantasizing or daydreaming about experiencing the product alone or with significant others in an imagined scenario should be a more vivid sensory and emotional experience, than merely envisioning an image of the product in mind.

Given the above discussions and findings, the following hypothesis is developed.

H3: Vivid mental imagery will evoke stronger emotional responses.

3.2.3. Diagnosticity of Product Information As Mediator

Consumers may use their online experiences as an information source when they form judgments about the product being presented. And when an online

experience serves an informational function, consumers are expected to evaluate the quality of the experience as an information source about the product. In doing so, they may consider several aspects of their online experience, including perceived diagnosticity of product information (e.g., how helpful and relevant was the information acquired from it for product evaluations), self-perceived expertise (e.g., am I knowledgeable enough to process the information provided from it), and the duration of experience (e.g., was it long enough to allow for a thorough evaluation) (Kempf and Smith 1998). Among these aspects, particularly interesting to the present study is consumers' perception of the diagnostic value of the information obtained. Specifically, they may assess the usefulness or utility of product-relevant information obtained in forming accurate judgments about the product. A key question to be raised in this process will be whether the experience provided useful information for product evaluations. Answer to this question is critical because the experience will be factored into judgments of the product to the degree to which consumers perceive the information obtained to be useful and diagnostic for an accurate judgment of the product.

Consistent with Kempf and Smith (1998), this study defines diagnosticity of product information as *the degree to which the consumer believes that product-relevant information acquired while interacting with a product web site is useful in correctly inferring his or her attitude toward the product presented.* That is, a given piece of product-relevant information is regarded as diagnostic to the extent to which the consumer perceives the information is helpful in forming accurate judgments about the quality and performance of a product.

In the context of this study, both cognitive elaboration and mental imagery are assumed to contribute jointly to the increase of the perceived diagnostic value of the product-related information acquired. Cognitive elaboration as well as mental imagery leads a consumer to think about and evaluate possible consequences of having and using a product in question, but in drastically different ways. When engaging in cognitive elaboration about the product, the consumer is likely to carefully assess pros and cons of having the product before arriving at an overall judgment about the product. This process is task-oriented and analytical in nature (Hirschmann and Holbrook 1982). Alternatively, the consumer may vicariously experience the product by visually imagining the product in use and use that imagined scenario as a basis for judgment formation about the product. This process tends to be experiential and holistic in nature (MacInnis and Price 1987). Despite the underlying differences in processing information, however, product-relevant information elicited as a result of effortful cognitive activity and vivid mental imagery will be perceived as a diagnostic basis for attitude formation about the product because both activities represent an added opportunity to elaborate on potential consequences for having and using the product. Based on this reasoning, the following set of hypotheses is developed.

H4: Cognitive elaboration will be positively associated with diagnosticity of product information acquired.

H5: Mental imagery will be positively associated with diagnosticity of product information acquired.

The greater the perceived diagnosticity of the informational basis of an attitude, the more accessible and confidently held the attitude is. According to Fazio (1995), people are sensitive to the diagnostic value of the evidentiary base upon which they are relying. Through their previous learning, individuals may come to trust certain kinds of information as a more reliable, relevant, and thus, more diagnostic indication of their attitudes, than are other kinds of information. For example, people may learn that information obtained via direct behavioral experience is more diagnostic of their attitudes, than information acquired via indirect experience such as word of mouth communication. More diagnostic grounds of an attitude are of concern here because the evaluation formed by such kinds of information may be noted more readily and held more confidently (Fazio 1995). In fact, this relationship of attitudinally diagnostic information to attitude accessibility and attitude confidence seems able to readily explain differential effects of direct *vs.* indirect experience with respect to the formation of strong attitudes (Berger and Mitchell 1989; Fazio 1995; Fazio and Zanna 1978a, 1978b, 1981; Smith and Swinyard 1983). Despite the lack of empirical evidence to directly support the diagnosticity-attitude accessibility relation, several studies exist to support the diagnosticity-attitude confidence relation (Kempf and Smith 1998; Koriat, Lichtenstein, and Fischoff 1980). The following set of hypotheses aims to reflect these propositions.

H6a: Higher levels of diagnosticity of product information will lead to more accessible brand attitude.

H6b: Higher levels of diagnosticity of product information will lead to more confident brand attitude.

3.2.4. Cognitive Elaboration, Attitude Strength, and Product Type

The extent of cognitive elaboration a consumer engages in for the product presented is associated with the development of strong brand attitudes. Petty and Cacioppo's influential dual-processing model of persuasion (1981, 1986), the Elaboration Likelihood Model (ELM), is relevant to this proposition. The ELM distinguishes two distinct routes to persuasion – central and peripheral routes. The central route refers to attitudes that are based on an effortful cognitive activity, whereby individuals focus their attention on issue-relevant arguments and product-related attributes, and draw on their prior experience to assess and elaborate on presented information. In contrast, the peripheral route refers to attitudes that are based on relatively simple "cues" in the persuasive setting that determine attitudes via simple decision rules (Petty, Cacioppo, and Schumann 1983).

A key postulate in the ELM is that the strength of an attitude is based on the extent of cognitive elaboration the individual has done about the attitude object. That is, when an attitude changes as a result of careful deliberation about the merit of the product (i.e., central route), the resulting attitude will be stronger than if an attitude changes via simple decision rules such as memory-based heuristics (i.e., peripheral route) (Petty and Cacioppo 1986; Petty, Haugtvedt, and Smith 1995). In explicating the underlying processes of this phenomenon, Petty and Cacioppo (1986) argued that:

> the process of elaborating issue-relevant arguments involves assessing the schema for the attitude object in order to evaluate each new argument....Under the peripheral route, however, the schema may be accessed only once to incorporate the affect or inference elicited by a salient cue....Under the central route then, the issue-relevant attitude schema may be accessed, rehearsed, and manipulated more times, strengthening the

> interconnections among the components and rendering the schema more internally consistent, accessible, enduring, and resistant than under peripheral routes. (p. 22)

In line with the above reasoning, it is hypothesized that brand attitudes formed as a result of more product-related cognitive activity are more accessible than brand attitudes formed in response to less product-related cognitive activity. An unpublished work by Petty, Haugtvedt, and Rennier (1995) provides direct empirical evidence of this proposition, reporting that attitudes stemming from elaborative cognitive processing are more accessible from memory than those resulting from less-elaborated cognitive processing (i.e., peripheral processing). Here, the very act of deliberation and elaboration may foster attitude rehearsal as the examination of different pieces of information leads to the same evaluation repeatedly, and this increased attitude rehearsal appears to account directly for the effect of cognitive elaboration on attitude accessibility (Berger and Mitchell 1989; Fazio 1995). Attitude rehearsal is also likely to increase the perception of consumers' confidence in their brand attitudes as it may cause them to make an attitudinal decision repeatedly about the product. Einhorn and Hogarth (1978) provide evidence that confidence in judgments increases as a function of how often the decision is made. Furthermore, a greater degree of thoughtful consideration and deliberation on product-relevant thoughts themselves should increase the level of confidence consumers have toward their attitude about the product (Petty, Cacioppo, and Schumann 1983).

In discussing the effects of cognitive elaboration on attitude accessibility and confidence, the role of product type is important. Especially, an idea of classifying products as utilitarian or hedonic becomes valuable in this study since it is inherently related to the conceptualizations of discursive and experiential processes, thus serving to

illuminate some boundary conditions in which each mode is likely to operate.

Utilitarian products are goods whose purpose of consumption is primarily functional and goal-driven (Dhar and Wertenbroch 200; Hirschmann and Holbrook 1982). Thus, an analytical analysis of tangible product qualities and utility performance serves as a main determinant of the formation and change of the consumer's attitude toward a utilitarian product (Hirschmann and Holbrook 1982). In contrast, for hedonic products, whose purpose of consumption is mainly to have fun and enjoyment, this cognitively charged analytical reasoning is less valued. Rather, for these products, a key determinant of brand attitude is the consumer's anticipation about how well the consumption of the product will serve to satisfy his or her emotional wants (Batra and Ahtola 1990; Hirschmann and Holbrook 1982).

Based on the preceding literature and discussion, it is hypothesized that greater product-related cognitive activity leads to more accessible and confident brand attitude. The relative contribution of cognitive elaboration on attitude strength dimensions, however, is likely to be moderated by whether the product under examination is perceived as primarily utilitarian or hedonic. The following set of hypotheses reflects this proposition.

> **H7**: Product type (utilitarian *vs.* hedonic) will moderate the relationship between cognitive elaboration and **(a)** accessibility and **(b)** confidence. For both relations, a stronger effect will be pronounced for participants exposed to a utilitarian product, than those exposed to a hedonic product.

3.2.5. Imagery-induced Emotion, Attitude Strength, and Product Type

Once evoked, emotions are associated with the product. It has been shown that

ad-induced emotions can influence attitude toward the ad and attitude toward the brand (Aaker, Stayman, and Hagerty 1986; Batra and Ray 1986; Burke and Edell 1989; Edell and Burke 1987; Holbrook and Batra 1987). Positive emotional responses (e.g., amused, happy, hopeful, elated) are associated with favorable attitude toward the ad and the brand, whereas negative emotional responses (e.g., skeptical, offended, depressed) are associated with unfavorable attitude toward the ad and the brand (Burke and Edell 1989). More relevant to this study are the results of studies of effects of emotional reactions to direct product experience, since virtual experience allows simulated direct experience with products. Prior research has identified "pleasure" and "arousal" as the two major dimensions of emotions most relevant to a direct experience situation (Havlena and Holbrook 1986; Mano and Oliver 1993). These two dimensions have been found to influence attitude toward the brand in the context of a trial (Kempf 1999; Kempf and Smith 1998).

Many previous studies in advertising and consumer behavior point to the significant role of emotions in attitude formation and change, whereas empirical studies directly examining the connection of imagery-evoked emotions to attitude formation and change are rare. Despite this dearth, a hint can be found in the research on the effect of emotions on attitude-behavior consistency in social psychology. Fazio, Zanna, and Cooper (1978), for example, conducted an experiment where two groups of participants were indirectly exposed to a set of puzzles by watching a videotape of people working out puzzle examples, while a narrator describes the puzzles. One group of participants was simply asked to listen and watch carefully while the other group was asked to emphasize and imagine how they would feel if they were in the position

of the people working on the puzzles. Interestingly, attitudes among participants focusing on feelings were found more predictive of later free-play behavior than were attitudes among participants for whom focusing on feelings was not emphasized. Although they did not directly assess attitude strength, it is reasoned that imagery-evoked emotional reactions to the puzzles were perceived as a trustworthy and diagnostic basis for evaluation about the puzzles (Fazio 1995; Millar and Millar 1996). Thus, the resulting attitude may have become readily accessible and held with more confidence, leading to more attitudinally consistent behavior during the free-play period. Millar and Millar (1996) found evidence that emotional responses to an attitude object indeed are positively associated with attitude accessibility.

As hypothesized for the cognitive elaboration - attitude accessibility and attitude confidence links, whether the product being examined is perceived as utilitarian or hedonic will play a significant role in determining the relative contribution of imagery-evoked emotions to the attitude strength dimensions. Especially, for hedonic products, where a sensory and experiential aspect of consumption matters, emotions elicited from imagined episodes of product use will constitute a crucial part of brand evaluation and, ultimately, its selection. It is reasoned that vicarious consumption of a product realized via mental imagery of experiential processing will provide hedonic value by allowing consumers to enjoy the product' benefits without purchasing it (Babin, Darden, and Griffin 1994; MacInnis and Price 1987). Consumers seek fun, pleasure, and excitement through the consumption of hedonic products, thus vicarious consumption of how well they would serve to satisfy emotional wants becomes an important informational source about those products

(Hirschmann and Holbrook 1982; MacInnis and Price 1987). In contrast, for utilitarian products, these affectively charged feelings are less valued in the formation of consumers' brand attitudes because they are primarily evaluated on their practical and instrumental values, rather than their experiential aspects of consumption.

In line with the preceding literature and reasoning, imagery-evoked emotions are expected to lead to accessible and confident attitudes toward the imagined product because emotional reactions elicited from imagined episodes are apt to involve a product under examination, and consumers seem to trust their emotional reactions to the product as diagnostic. The relative contribution of imagery-evoked emotions on attitude strength dimensions, however, is likely to be moderated by whether the product under examination is perceived as primarily utilitarian or hedonic. The following set of hypotheses reflects this proposition.

H8: Product type (utilitarian *vs.* hedonic) will moderate the relationship between emotional responses and **(a)** accessibility and **(b)** confidence. For both relations, a stronger effect will be pronounced for participants exposed to a hedonic product, than for those exposed to a utilitarian product.

Chapter 4. Methodology

4.1. Research Design

An experiment was conducted in a lab setting. Since the effects of presentation mode and product type were of particular interest of this research, these two variables became the treatment factors in a 2 x 2 mixed factorial design. The between-subject factor was presentation mode (2-D or 3-D) and the within-subject factor was product type (utilitarian or hedonic). Participants were randomly assigned to either the 2-D or the 3-D treatment conditions and were exposed to both product categories – one representing a utilitarian product (IBM laptop computer) and the other representing a hedonic product (Kodak digital camera). The order in which the different types of products were displayed was randomized for each participant to avoid possible order effect. Participants were in groups of 5 to 10 in a spacious computer lab, where they were isolated each other so that they could complete the experiment independently. Survey questionnaire and participant instructions used in the experiment are shown in Appendix 1 and 2.

4.2. Participants

A total of 238 undergraduate students enrolled at a Midwestern university participated in the experiment in return for class credit. Participants' ages ranged from 18 to 25, and approximately 66% were female. All participants signed an informed consent form prior to their participation in the experiment. A student sample is considered appropriate for this experiment because they have high Internet literacy and represent early adopters of e-commerce in 3-D product visualization (Li, Daugherty, and Biocca

2001). After eliminating five incomplete responses, a total of 233 usable surveys were obtained. Further, seven surveys from the IMB laptop computer condition and six surveys from the Kodak digital camera condition were deleted due to response error during the response latency test (see *Attitude Accessibility* in section 4.5 Scales for further explanation). As a result, 226 usable surveys were included in the final sample for construct validation and hypothesis testing for the IMB laptop computer and 227 responses for the Kodak digital camera. For manipulation checks, the pooled sample with 221 surveys was used.

4.3. Stimulus

Four stimulus web sites were created to represent four experimental conditions. A laptop computer and a digital camera were selected as the test product categories representing the utilitarian and hedonic product classification for the experiment based on the results of a pretest and previous research. A pretest, consisting of 35 participants taken from the same population pool as those in the main experiment, indicated that laptops and digital computers are relevant to the intended participant's population (i.e., undergraduate students). More importantly, these products were perceived to be significantly different in terms of their utilitarian and hedonic natures. In the pretest, participants were asked to categorize laptops and digital cameras as primarily utilitarian, defined as practical, functional, or something that helps achieve a goal (e.g., pain killer), as primarily hedonic, defined as pleasant and fun, or something that is enjoyable and appeals to senses (e.g., perfume), and as both utilitarian and hedonic (Dhar and Wertenbroch 2000).

As shown in Table 1, the majority of participants classified laptops as primarily

utilitarian (21 out of 35 participants) and digital cameras as primarily hedonic (20 out of 35 participants). Previous research also suggests that these two product categories represent product types whose salient features can be adequately evaluated with 3-D interfaces, not necessarily requiring tactile inspection (Li, Daugherty, and Biocca 2001; 2002; 2003).

Table 1. Results of Pretest 1

Perceived Function	Product Category	
	Laptop computer	Digital camera
Utilitarian	21	5
Hedonic	6	20
Both	8	10
Total	35	35

Note: $\chi^2_{(2)} = 11.37, p < .01$ for laptop computer; $\chi^2_{(2)} = 9.31, p < .01$ for digital camera.

A second pretest (N=37) was conducted to select a brand name and salient product attributes for each of the two test product categories. IMB and Kodak were identified in the pretest as a brand with neutral brand attitudes in each category against six major manufactures respectively (SONY, Dell, Sharp, Toshiba, HP, Gateway for laptops, SONY, Olympus, Samsung, Minolta, Fuji, Pentax for digital cameras) and thus chosen for the test brands (see Li, Daugherty, and Biocca 2002 for a similar case). Participants were asked to rate their preferences for seven popular laptop and digital camera brands using a seven-point semantic differential scale item (1=like/7=dislike). For laptops, results indicate that SONY, HP, Dell comprise a more favored brands group, while Gateway, Toshiba, and Sharp a less favored brands group, with IBM as a neutral

brand between these two sets of brands. For digital cameras, SONY, Olympus, and Samsung comprise a more favored brands group, while Fuji, Minolta, and Pentax a less favored brands group, with Kodak as a neutral brand between these two sets of brands (Table 2).

Table 2. Results of Pretest 2

Laptop Computer brands	Mean	Digital camera brands	Mean
SONY	5.88	SONY	6.19
HP	5.31	Olympus	5.25
Dell	5.28	Samsung	5.14
IBM	5.09	Kodak	5.00
Gateway	4.78	Fuji	4.75
Toshiba	4.25	Minolta	4.06
Sharp	3.94	Pentax	3.53

Note: N=37

Salient product attributes were also identified in the pretest using free elicitations. During the pretest, participants were asked to list product attributes that they thought were important to consider for the selection of a laptop and a digital camera. A total of 18 attributes were identified for a laptop and a digital camera each. Among those, the seven most salient attributes (quality, size/weight, price, design/style, battery life, tech-support/warrantee, and battery life for both laptops and digital cameras and wireless-Internet capability for only laptops and easy to use for only digital cameras) were used, along with a company logo, a headline, and a sub-headline to construct the stimulus web sites.

Four web sites, consisting of 2-D and 3-D pages for a laptop and a digital camera each, were created to represent the four treatment conditions. All features were identical in the 2-D and 3-D versions except for the presentation mode: the 3-D version had the product in a 3-D visualization where participants can move, zoom in or out, and rotate the product; the 2-D version had the product in a series of still photos. In the 2-D conditions, multiple photos of the test product (an IBM laptop or a Kodak digital camera) were displayed in an attempt to equate the amount of information available between the 2-D and 3-D conditions, thus minimizing possible confounding due to information effects. The 2-D web site for the IBM laptop computer showed the front, side, bottom of the laptop, all with its lid open, while the 2-D web site for the Kodak digital camera showed the front, back, and the top of the camera. In fact, for both products, participants perceived the amount of information from the 2-D and 3-D conditions not different ($M_{2Dlaptop}$ = 5.84 *vs.* $M_{3Dlaptop}$ = 5.66, $t(224) = 1.32$, $p > .05$; $M_{2Dcamera}$ = 5.92 *vs.* $M_{3Dcamera}$ = 5.85, $t(225) = .59$, $p > .05$), suggesting this attempt was successful.

4.4. Procedures

Upon arriving at a computer lab for the main experiment, participants were greeted and asked to fill out a consent form and a short survey. The survey included items measuring participants' abilities to imagine, product category experience, and brand familiarity, which are the control variables of the study. Participants' background information and computer usage were also collected in the short survey. After completing the short survey, they were seated before a computer terminal corresponding to the assigned experimental condition. The first screen of the computer explained that the study

concerns "the evaluation of two products to be presented on web sites." The screen also contained instructions that upon completion of the web sites viewing, they would be asked to report their opinions and thoughts. The instructions were necessary to have participants pay close attention to test materials and actively engage in brand information processing (Kempf and Smith 1998; Li, Daugherty, and Biocca 2002).

After reading the instructions, participants were directed to the first product promotion web site where they were allowed to take as much time as necessary to examine the web site (Griffith and Chen 2004; Li, Daugherty, and Biocca 2003). After viewing the web site, participants were asked to complete a portion of the survey inquiring about the dependent variables of the study for the product examined. Measures for interactivity, vividness, and product type (i.e., whether the product is perceived as utilitarian or hedonic) were also included as manipulation checks for the presentation mode and product type treatments. After completing the relevant portion of the survey, participants were directed to the second product promotion web site. After viewing the second web site, participants were asked to complete the remaining portion of the survey inquiring about the dependent variables for the second product examined.

Completing the survey, participants were then given instructions about the response latency test to measure attitude accessibility. Prior to the collection of latency data, participants were given a series of practice trials to familiarize them with test procedures. The whole experiment took about 35 to 40 minutes to complete.

4.5. Scales

Most of the scales were adopted from previous research with some modified to fit

the context of this study. As recommended by Anderson and Gerbing (1984) and Bentler and Chou (1987), all constructs of this study, except for cognitive elaboration and attitude accessibility, were measured by at least three observable indicators (items). These items were written in the form of statements, most using a seven-point Likert or semantic differential rating system.

4.5.1. Scales of Endogenous Variables

Cognitive Elaboration. A standard thought-listing procedure (Cacioppo and Petty 1981) was used to measure the degree of participants' elaborated thinking toward the test products. Participants were given a lined, blank sheet of paper on which they were instructed to write down all their thoughts that went through their mind while they viewed the web site for the test product. They were told to ignore spelling, punctuation, and grammar. A time limit of ten minutes was imposed on the task to increase the validity of the measure. The purpose of imposing the time limit was to allow sufficient time for complete recording of the honestly spontaneous thoughts, while reducing the probability that purely reactive thoughts were listed (Cacioppo and Petty 1981; Wright 1973). Once collected, the semantic contents of cognitive responses (i.e., listed thoughts) were coded into self-thoughts, product-thoughts, and irrelevant thoughts[3] (Schlosser 2003; Shavitt and Brock 1986) by two judges blind to participants' experimental condition and the research hypotheses (Cacioppo and Petty 1981). Operational definitions of these thought

[3] Initial coding categories of cognitive responses also included a category for ad-related execution thoughts (e.g., participants' evaluations of ad style). For the purpose of this dissertation, however, these thoughts were classified as irrelevant. Although ad execution-related thoughts have been shown to affect attitude toward the ad and subsequently brand attitude in certain situations (Batra and Ray 1986; Edell and Burke 1987), the link mainly represents what can be characterized as the peripheral or the heuristic attitude change process, which has little bearing on the dimensions of attitude strength, the focal concepts of this dissertation (Haugtvedt and Priester 1997; Petty, Haugtvedt, and Smith 1995).

categories are shown in Table 3.

Table 3. Operational Definitions of Thought Categories

Thought Categories	Definition
Self-Thought	Statements involving references to own purchasing or trying of the product, self-characterizations and associations, and statements about others' reactions. e.g.) "I usually use this brand." "This camera would work well with my computer." "My girl friend would like the design of this camera (laptop)."
Product-Thought	Statements about the performance of the product, restatements or elaboration of the selling ideas, including participants' simple playback and the references to the product class. e.g.) "This camera has a red eye reduction function." "This laptop has two USB ports." "It is overpriced compared to other brands with similar specs."
Irrelevant Thought	All other statements not categorized in one of the above two categories.

Specifically, coders were instructed to proceed hierarchically: they considered whether a listed thought belonged to the self-thought category, or the product-thought category, or, finally, irrelevant thought category (Shavitt and Brock 1986). When a listed thought included both self- and product-thought, it was classified as a self-thought. Finally, the number of self- thoughts and the number of product-thoughts were summed for each participant to form an index for the degree of elaborated thinking about the product for the participant. This summed index was used in the estimation of the hypothesized effects of cognitive response on its presumed consequent variables in

Figure 1.

The judges coded a total of 2,118 thoughts (1061 thoughts for the IBM laptop computer; 1057 thoughts for the Kodak digital camera) and agreed on 78% of the classifications. The researcher resolved disagreements. Table 4 and 5 shows the descriptive statistics for product-relevant thought by experimental conditions. It should be noted that several participants recorded no product-relevant thought: ten participants in the 3-D condition for both products (8.8% of participants per product condition) and four participants in the 2-D condition for the Kodak digital camera (3.5% of participants) recorded "0" product-relevant thought. Here, the response "0" does not mean the participant did not record any thought. It simply means the participant did not record any self- or product-thoughts, as operationalized in Table 3. In fact, when considering all thought categories, no participant recorded "0" thought.

Table 4. Descriptive Statistics for Product-relevant Thought (IBM laptop computer)

	Mean	S.D.	Min.	Max.
2-D	5.24 (6.79)	2.11 (2.35)	1 (2)	12 (14)
3-D	4.16 (6.21)	2.60 (2.28)	0 (2)	14 (15)

Note: N = 112 for the 2-D condition, N = 114 for the 3-D condition; Numbers in parentheses refer to when all the three thought categories are considered.

Table 5. Descriptive Statistics for Product-relevant Thought (Kodak digital camera)

	Mean	S.D.	Min.	Max.
2-D	4.90 (6.46)	2.59 (2.32)	0 (2)	14 (14)
3-D	4.41 (6.40)	2.96 (2.53)	0 (1)	14 (14)

Note: N = 113 for the 2-D condition, N = 114 for the 3-D condition; Numbers in parentheses refer to when all the three thought categories are considered.

Mental Imagery. Measures of mental imagery were adopted from prior research (e.g., Babin and Burns 1997; Bone and Ellen 1982) and measured the degree of vividness of a mental image. Although mental imagery is a multidimensional concept, encompassing vividness, quantity, ease, and ability to manipulate images (see Bone and Ellen 1982 for a review), vividness dimension of imagery seems most appropriate in the context of the present study examining the effect of 3-D induced imagery on emotions. To measure imagery vividness, a five-item seven-point Likert scale was used that asked how clear, vivid, intense, lifelike, and sharp the images are (Bone and Ellen 1982).

Emotional Response. A five-item seven-point semantic differential scale was used to measure pleasure and arousal in response to mental imagery. Pleasure and arousal have been identified as the two major components of emotions relevant to consumption experience such as product use and trials (Havlena and Holbrook 1986; Kempf and Smith 1998; Mano and Oliver 1993). The items included: "Happy – Unhappy," "Pleased – Annoyed," "Excited – Calm," "Stimulated – Relaxed," and "Aroused – Unaroused" (Kempf and Smith 1998; Mano and Oliver 1993).

Information Diagnosticity. Diagnosticity of product information was measured using a three-item seven-point semantic differential scale. The first two items asked, "In judging the quality and performance of the product, overall, how helpful would you rate product-related information you obtained during exposure to the web site?" and "In understanding different features of the product presented, overall, how helpful would you rate the product-related information you obtained during exposure to the web site?" bounded by "Not helpful at all - Extremely helpful." The last item asked, "To what extent did product-related information you obtained during exposure to the web site enable you

to accurately evaluate the product presented?" The end points were labeled "It did not enable me to evaluate the product at all" and "It fully enabled me to evaluate the product." The midpoint was labeled "It somewhat enabled me to evaluate the product." The first and third items were adopted from Kempf and Smith (1998) and modified to fit the context of this study. The second item was newly developed for the study.

Attitude Accessibility. Attitude accessibility was operationalized as the latency of response to an attitudinal inquiry (Fazio 1986, 1990). A computer program was developed to measure response latencies (i.e., reaction time). Participants were told that a series of brand names from various product categories will appear on a computer screen and that they need to press one of two keys on the keyboard, "z" for "like" or "/" for "dislike" to indicate their feelings about each brand (Jewell and Unnava 2003). Consistent with established procedures for measuring response latencies, participants were encouraged to respond as quickly and as accurately as possible (Fazio 1990; see Appendix 3).

In addition, to avoid confusion resulting from a single brand name being represented in multiple product categories, the presentation of a brand name was paired with its product category (e.g., EDDIE BAUER - clothing, DELL - laptop). A two-second interval separated each trial, and the order of presentation of the brand names was randomized for each participant to rule out order effects. The program recorded each response (like or dislike) and the response latency in milliseconds (i.e., the duration of time between the appearance of the brand name and the response). To familiarize participants with the test procedure, participants performed ten trials involving brand names different from those used in the actual latency test, with an extra opportunity to repeat the trial session, if they wanted. After the trial session, participants were asked to

respond to 20 brand names, including two target test brands and 18 filler brands.

Once collected, raw latency scores were inspected for two kinds of possible errors. First, the participant's dichotomous response (like or dislike) during the latency test was compared with his earlier response on a separate brand attitude scale. Specifically, prior to the response latency test, participants were asked to rate their feelings about the two test products on a four-item seven-point semantic differential scale, bounded by "Bad - Good," "Dislike quite a lot - Like quite a lot," "Unpleasant - Pleasant," and "Poor quality - Good quality" (Gardner 1985; Machleit and Wilson 1988). These items were highly correlated each other (Cronbach's alpha = .91 for the IBM laptop computer; Cronbach's alpha = .93 for the Kodak digital camera), thus they were summed and averaged to construct a single composite index for brand attitude. The participant's score on this composite index was then compared with his or her response during the computerized latency test. An error was defined as the participant's responding "like" during the latency test but rating the product negatively below the neutral point on the attitude scale (i.e., "4"), or responding "dislike" during the latency test but rating the product positively above the neutral point on the scale (Fazio, Powell, and Williams 1989). At the end, seven surveys from the IMB laptop computer condition and six surveys from the Kodak digital camera condition were deleted due to such response error. It is a common practice to limit the analysis to those latencies associated with a given response (Fazio 1990).

Second, the participant's latency scores for the two target brands (one representing a utilitarian product and the other representing a hedonic product) were adjusted to control for error variance due to individual differences in general responding. To standardize the latencies across participants, each participant's latency score to the test

brand was divided by the mean of latency scores for the rest of 18 brands (test latency/mean filler latency) (Fazio 1990; Jewell and Unnava 2003).

Attitude Confidence. Attitude confidence was measured by a three-item seven-point semantic differential scale, adopted from Berger and Mitchell (1989) and White, Tashchian, and Ohanian (1991). Participants were asked to rate their certainty that their judgments about the two test products were accurate on a three-item seven-point semantic differential scale, bounded by "Not confident - Confident," "Not sure - Sure," and "Uncertain – Certain."

4.5.2. Scales of Exogenous Control Variables

Ability to Imagine. Given that individual differences in imagining ability may affect the imagery evoked (see MacInnis and Price 1987 for a review), ability to imagine needs to be controlled for mental imagery. Ability to imagine was measured using Sheehan' s (1967) shortened version of Betts' (1909) Questionnaire Upon Mental Imagery (QMI).

Product Category Experience. Product category experience was measured and used as a control for cognitive elaboration and attitude confidence. Personal experiences with a given product category may affect the degree of cognitive elaboration via increased domain knowledge (Celci and Olson 1988). Ability to process information such as domain knowledge has been found to increase cognitive elaboration (Petty and Cacioppo 1986). Product category experience may also positively correlate with levels of attitude confidence because they may serve as a valid cue (e.g., perceived expertise) when the consumer assesses whether his or her confidence toward a product from the

category is correct.

Product category experience was measured using self-reports of amount of product search, usage, and ownership. This use of search, usage, and ownership as indicators of product category experience is consistent with Alba and Hutchinson's conceptualization of product experience (Alba and Hutchinson 1987). Amount of search and usage was measured on nine-point items. Ownership was a dichotomous measure of laptop computer and digital camera ownership at the time of data collection.

Brand Familiarity. Brand familiarity was measured as a control for mental imagery, attitude accessibility, and attitude confidence. Brand familiarity needs to be controlled because it may affect both the ability to imagine and the vividness of the imagery (Burns, Biswas, and Babin 1993; MacInnis and Price 1987). Increased levels of consumers' familiarity with a given product have also been found to result in increased attitude accessibility and attitude confidence (e.g., Berger and Mitchell 1989; Fazio and Zanna 1978a, b). Brand familiarity was measured using a three-item seven-point semantic differential scale, bounded by "Unfamiliar - Familiar," "Inexperienced - Experienced," and "Not knowledgeable - Knowledgeable."

5. Data Analysis

Manipulations of the presentation mode and product type were checked by ANOVA and chi-square tests. Prior to testing the proposed research model, ANCOVA tests were performed to examine the effects of the presentation mode and product type manipulations on attitude accessibility and attitude confidence, with product category experience and brand familiarity as two varying covariates. The result of the ANCOVA

tests helped determine the appropriateness of testing the proposed research model, by demonstrating ultimate effects of the presentation mode manipulation on attitude accessibility and confidence. Next, the proposed research model was tested. Testing of the proposed research model itself was two-fold: the assessment of the measurement model and the assessment of the structural model. AMOS 4.01, a structural equation modeling (SEM) program, with maximum-likelihood (ML) parameter estimation method was employed. All the constructs of the study were represented as latent variables.

The use of latent variable SEM method in this study is appropriate for several reasons. Firstly, since the impetus behind this research was to examine the causal processes by which 3-D presentation influences attitude accessibility and confidence, the proposed model should be inspected for evidence of substantial and continuous paths from presentation mode to the two constructs. SEM is appropriate for situations where examination of causal relationships between multiple variables is the focus of the study (Anderson and Gerbing 1988; Bollen 1989). Secondly, SEM allows for testing a causal model with multiple final dependent variables. As attitude accessibility and attitude confidence constitute two final variables in the proposed research model, SEM can test this model by allowing their disturbance terms to covary (see Chaudhuri and Holbrook 20001 for a similar example).

Thirdly, most items of this research reflect not only the construct they are intended to measure, but also random and systematic measurement error. In multiple equation systems with multiple variables, measurement error can inflate or deflate estimates of the relations between the variables, thus leading to both Type I and Type II errors (MacKenzie 2001). In this regard, latent variable SEM appears the right choice

because it considers measurement error when assessing the structural relationships between the variables (Kline 1998). Moreover, latent variable SEM has also been used for experimental data (Bagozzi and Yi 1989), and has the potential to fundamentally improve experimental research in the field of consumer behavior (MacKenzie 2001).

Testing of the measurement and structural models was performed separately for each test product. As a result, two measurement models (one for the IBM laptop computer and another for the Kodak digital camera) and two structural models (one for the IBM laptop computer and another for the Kodak digital camera) were developed. Following the procedures advocated by Anderson and Gerbing (1988) and Hunter and Gerbing (1982), model fit of the measurement models was assessed prior to estimating the proposed structural relations between the variables. This two-step approach is recommend because it minimizes the potential for "interpretational confounding" of the constructs that may occur with the use of a one-step approach in which the measurement and structural models are estimated simultaneously (Anderson and Gerbing 1988, p.418). Specifically, the initial measurement model was subject to a series of respecifications so that the final measurement model fits the data. To facilitate the moderation hypotheses testing of product type, emphasis was placed on establishing two acceptable and comparable measurement models for each of the two test products (i.e., two equivalent confirmatory factor analysis models with the same observable items). Once a measurement model with acceptable fit for both products was established, the researcher subsequently tested the proposed structural relationships among the constructs. Research findings following these methods of data analysis are presented in the next chapter.

Chapter 5. Results

5.1. Manipulation Checks

The presentation mode manipulation was assessed from participants' ratings of interactivity and vividness of the stimulus web sites. Participants were asked to indicate how interactive and vivid they perceive the web sites on two seven-point Likert scale items. The items asked "The web site I just visited included various interactive features" and "The web site I just visited included vivid product description." A two-way ANOVA examined the impact of the presentation mode and the product type treatments on the perceived interactivity and the perceived vividness.

The analysis showed significant main effects of the presentation mode on the perceived interactivity ($F(1, 219) = 288.21, p < .001$) and the perceived vividness ($F(1, 219) = 49.15, p < .001$). The effects were in predicted directions in that, compared to 2-D participants, 3-D participants perceived the 3-D web sites to be more interactive, ($M_{2D} = 3.15$ *vs.* $M_{3D} = 5.81$) and more vivid ($M_{2D} = 5.01$ *vs.* $M_{3D} = 5.89$). There were no significant main or interaction effects involving product type for either perceived interactivity ($F(1, 219) = 1.14, p = .29$ for main effect; $F(1, 219) = .27, p = .61$ for interaction effect) or perceived vividness ($F(1, 219) = 1.22, p = .27$ for main effect; $F(1, 219) = .36, p = .55$ for interaction effect). The researcher interpreted these results as evidence of successful independent manipulation of presentation mode. Table 6 summarizes the results of the ANOVA test.

Table 6. Results of Presentation Mode Manipulation Check

Items	Manipulation				*F*		
	Presentation Mode (PM)		Product Type (PT)				
	2-D	3-D	IBM	Kodak	PM	PT	PM x PT
Perceived Interactivity	3.15	5.81	4.43	4.52	288.21***	1.14	.27
Perceived Vividness	5.01	5.89	5.41	5.49	49.15***	1.22	.36

Note: N = 221; *** $p < .001$.

To verify the integrity of the product type manipulation, participants were asked to categorize the two test products as primarily utilitarian, defined "as useful, practical, functional, something that helps achieve a goal," as primarily hedonic, defined "as pleasant and fun, something that is enjoyable and appeals to the sense," and as both utilitarian and hedonic (Dhar and Wertenbroch 2000). As shown in Table 7, the majority of participants classified the IBM laptop computer as primarily utilitarian (132 of 221 participants, $\chi^2_{(2)} = 116.05, p < .001$) and the Kodak digital camera as primarily hedonic (148 of 221 participants, $\chi^2_{(2)} = 134.56, p < .001$). The researcher interpreted this as evidence of successful manipulation of product type.

Table 7. Results of Product Type Manipulation Check

	Product Type Manipulation	
Perceived Function	IBM laptop computer	Kodak digital camera
Functional	132	8
Hedonic	3	148
Both	86	65
Total	221	221

Note: $\chi^2_{(2)} = 116.05, p < .001$ for the IBM laptop computer; $\chi^2_{(2)} = 134.56, p < .001$ for the Kodak digital camera.

5.2. Measurement Model Assessment

The assessment of the measurement models took place in three phases, as follows: (i) item purification, (ii) scale reliability assessment, and (iii) construct validity assessment.

5.2.1. Item Purification

Items were purified through the procedure recommended by Anderson and Gerbing (1984) and Gerbing and Anderson (1988). Except for cognitive elaboration and attitude accessibility, all seven latent constructs with multiple items in this study - mental imagery, information diagnosticity, emotional response, attitude confidence, ability to imagine, product category experience, and brand familiarity - were subject to confirmatory factor analysis (CFA). Thus, a fully correlated seven-factor CFA model with 27 items was initially fitted to the data for each test product.

Specifically, the item purification process was carried out in two phases. Firstly, the researcher purified items by assessing their unidimensionality and their individual item-construct loading (i.e., factor loading). Achieving unidimensional measurement is a crucial undertaking in theory testing and development because it allows the most unambiguous assignment of meaning to the estimated constructs (Gerbing and Anderson 1988). Empirically, unidimensionality is achieved when each item loads on a single factor and the measurement error terms are uncorrelated (Gerbing and Anderson and 1988). Secondly, an item with its factor loading less than .70 was considered unreliable and thus removed from further analysis (Kline 1998).[4] Individual item-construct reliability is

[4] Squared factor loadings are termed reliabilities. Thus, items with their factor loadings below .70 have

considered adequate when an item has a factor loading greater than .70 on its intended construct, which implies more shared variance between the construct and the item than error variance.

After eliminating items with substantial cross-loadings or low loading on their intended constructs, the final measurement model with 25 out of the 27 original items reflecting seven constructs, was found to fit the data for both products. Table 8 presents various fit indices of the final measurement model for the IBM laptop computer and the Kodak digital camera. SEM literature suggests that when sample sizes are less than 250, the standard root mean squared residual (SRMR) and one of the other recommended fit indices such as Tucker Lewis Index (TLI) and Comparative Fit index (CFI) should be reported (Holbert and Stephenson 2002; Hu and Bentler 1999).[5] In general, SRMR values less than .10 (Kline 1998) or close to .09 (Hu and Bentler 1999), along with TLI and CFI values higher than .90, are considered representative of a well-fitting model (Kline 1998), with Hu and Bentler (1999) recommending a cutoff point close to .95. The root mean square error of approximation (RMSEA) was also used with a cutoff point of .06 (Holbert and Stephenson 2002).

The indices for the final measurement model indicate an adequate fit with the data: TLI = .94; CFI = .95; SRMR = .05, RMSEA = .06 for the IBM laptop computer; TLI = .95; CFI = .96; SRMR = .04; RMSEA = .05 for the Kodak digital camera (Table 8). The model χ^2 statistics were statistically significant ($\chi^2_{(254)}$= 435.86, $p < .001$ for the IBM

---

reliabilities less than .5 (.70 x .70 = .49), which implies that at least 50% of the observed variance is due to random measurement error.

[5] More traditional fit indices such as Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), and χ^2/df ratio, are not reported here because SEM literature warns against use of such fit indices due to their sensitivity to sample size, model specification, and distributional properties of the model's variables (Holbert and Stephenson 2002; Hu and Bentler 1999).

laptop computer; $\chi^2_{(254)}$= 429.66, $p < .001$ for the Kodak digital camera). The significant χ^2 statistics were expected due to their sensitivity to sample sizes (Kline 1998).

Table 8. Summary of Fit Indices of Final Measurement Models

Final measurement model (seven-factor model, 25 items)	χ^2	*df*	TLI	CFI	SRMR	RMSEA
IBM laptop computer	435.86***	254	.94	.95	.05	.06
Kodak digital camera	429.66***	254	.95	.96	.04	.05

Note: N = 226 for the IBM laptop computer, N = 227 for the Kodak digital camera.
*** $p < .001$.

The descriptive statistics of items and item-construct loadings with t-values are shown in Table 9 (IMB laptop computer) and Table 10 (Kodak digital camera). As shown in Tables 9 and 10, all the item-construct loadings were significant (t-values between 6.78 and 19.48 for the IBM laptop computer; t-values between 5.26 and 19.42 for the Kodak digital camera) and above the benchmark of .70 except for three items for ability to imagine in both products (LAI3 = .67, LAI4 = .66, LAI5 = .47 for the IBM laptop computer; CAI3 = .67, CAI4 = .65, CAI5 = .47 for the Kodak digital camera) and one item for product category experience for the Kodak digital camera (CPCE3 = .61). Despite their relatively low item-construct loading, these items are retained because the scales with these items only serve as control variables in this study, and these items were not substantially cross-loaded on other constructs, therefore, not undermining unidimensionality of the measurement model for both products.

Table 9. Proposed Measurement Items for Constructs (IBM laptop computer)

Constructs	Measured Items		Mean	S.D.	Factor Loading	
					Std.	t-value
MENTAL IMAGERY		How would you describe the images that occurred in your mind while examining the web site materials? The images were:				
	LMI1	Clear	4.98	1.17	0.85	15.49
	LMI2	Vivid	4.69	1.25	0.87	16.11
	LMI3	Intense	3.83	1.45	0.76	13.05
	LMI4	Lifelike	4.58	1.39	0.80	14.11
	LMI5	Sharp	4.65	1.38	0.85	15.57
EMOTIONAL RESPONSE		Tell us how you felt while you were viewing the web site.				
	LER1	Happy - Unhappy	4.26	0.79	0.82	14.57
	LER2	Pleased - Annoyed	4.37	0.88	0.83	15.01
	LER3	Excited - Calm	2.99	1.15	0.85	15.40
	LER4	Stimulated - Relaxed	3.49	1.17	0.88	16.31
INFORMATION DIAGNOSTICITY		The following items concern your evaluation about product-related information obtained during exposure to the web site. Product-related information includes any ideas, thoughts, and images about the product you had while examining the web site, in addition to the product information directly obtained from the web site.				
	LDIAG1	In judging the quality and performance of the product, overall, how helpful would you rate the product-related information you obtained? (Not helpful at all - Extremely helpful)	4.97	1.09	0.83	14.22
	LDIAG2	In understanding different features of the product, overall, how helpful would you rate the product-related information you obtained? (Not helpful at all - Extremely helpful)	5.07	1.11	0.76	12.67
	LDIAG3	To what extent did the product-related information you obtained enable you to accurately evaluate the product? (It did not enable me to evaluate the product at all - It fully enabled me to evaluate the product)	4.71	1.06	0.79	13.41
ATTITUDE CONFIDENCE		How certain are you of the accuracy of the responses you gave regarding your feelings toward the product?				
	LAC1	Not confident - Confident	5.71	0.98	0.92	17.82
	LAC2	Not sure - Sure	5.71	0.97	0.91	17.56
	LAC3	Uncertain - Certain	5.58	1.02	0.92	17.87

Table 9. (Cont'd)

Constructs	Measured Items		Mean	S.D.	Factor Loading Std.	Factor Loading t-value
ABILITY TO IMAGINE		Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. And classify the images suggested by the following questions as indicated by the degree of clearness and vividness. (No image present at all - Perfectly clear and as vivid as actual experience)				
	LAI1	The exact contour of face, head, shoulders and body.	5.21	1.18	0.72	11.11
	LAI2	Characteristic poses of head, attitudes of body, etc.	4.97	1.25	0.74	11.60
	LAI3	The precise carriage, length of step, etc. in walking.	4.31	1.31	0.67	10.25
	LAI4	The different colors worn in some familiar costume. Think of seeing the following, considering carefully the picture that comes before your mind's eye.	4.84	1.47	0.66	10.03
	LAI5	The sun as it is sinking below the horizon.	5.54	1.19	0.47	6.78
PRODUCT CATEGORY EXPERIENCE		Indicate your experience with a laptop computer in general.				
	LPCE1	How often do you use a laptop computer? (9 pt item: Never - Everyday)	5.65	3.28	0.80	9.09
	LPCE3	Overall, how much time have you spent searching for laptop computer? (9 pt. item: Very little - Very much)	3.71	2.57	0.81	9.12
BRAND FAMILIARITY		Indicate your familiarity with IBM laptop computer.				
	LBF1	Unfamiliar - Familiar	3.32	1.92	0.88	16.79
	LBF2	Inexperienced - Experienced	3.03	1.79	0.94	18.43
	LBF3	Not knowledgeable - Knowledgeable	3.11	1.82	0.96	19.48

Note: N= 226; Std.: Standardized; LER5 (Aroused - Unaroused), LPCE2 (Do you currently own a laptop computer? Yes or No) were deleted during the purification process.

Table 10. Proposed Measurement Items for Constructs (Kodak digital camera)

Constructs	Measured Items		Mean	S.D.	Factor Loading Std.	t-value
MENTAL IMAGERY		How would you describe the images that occurred in your mind while examining the web site materials? The images were:				
	CMI1	Clear	5.35	1.13	0.87	16.39
	CMI2	Vivid	5.12	1.27	0.90	17.30
	CMI3	Intense	4.17	1.39	0.83	15.10
	CMI4	Lifelike	5.07	1.43	0.84	15.47
	CMI5	Sharp	5.13	1.34	0.89	17.00
EMOTIONAL RESPONSE		Tell us how you felt while you were viewing the web site.				
	CER1	Happy - Unhappy	5.11	1.00	0.91	17.89
	CER2	Pleased - Annoyed	5.19	1.06	0.93	18.52
	CER3	Excited - Calm	4.00	1.27	0.92	18.20
	CER4	Stimulated - Relaxed	4.33	1.34	0.94	18.76
INFORMATION DIAGNOSTICITY		The following items concern your evaluation about product-related information obtained during exposure to the web site. Product-related information includes any ideas, thoughts, and images about the product you had while examining the web site, in addition to the product information directly obtained from the web site.				
	CDIAG1	In judging the quality and performance of the product, overall, how helpful would you rate the product-related information you obtained? (Not helpful at all - Extremely helpful)	5.24	0.99	0.80	13.88
	CDIAG2	In understanding different features of the product, overall, how helpful would you rate the product-related information you obtained? (Not helpful at all- Extremely helpful)	5.18	1.11	0.81	14.24
	CDIAG3	To what extent did the product-related information you obtained enable you to accurately evaluate the product? (It did not enable me to evaluate the product at all - It fully enabled me to evaluate the product)	5.10	0.93	0.82	14.46
ATTITUDE CONFIDENCE		How certain are you of the accuracy of the responses you gave regarding your feelings toward the product?				
	CAC1	Not confident - Confident	5.88	0.90	0.91	17.82
	CAC2	Not sure - Sure	5.82	0.97	0.95	19.22
	CAC3	Uncertain - Certain	5.77	1.01	0.93	18.18

Table 10. (Cont'd)

Constructs	Measured Items		Mean	S.D.	Factor Loading Std.	Factor Loading Mean
ABILITY TO IMAGINE		Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. And classify the images suggested by the following questions as indicated by the degree of clearness and vividness. (No image present at all - Perfectly clear and as vivid as actual experience)				
	CAI1	The exact contour of face, head, shoulders and body.	5.21	1.18	0.73	11.39
	CAI2	Characteristic poses of head, attitudes of body, etc.	4.96	1.25	0.73	11.47
	CAI3	The precise carriage, length of step, etc. in walking.	4.32	1.30	0.67	10.28
	CAI4	The different colors worn in some familiar costume.	4.85	1.47	0.65	9.91
		Think of seeing the following, considering carefully the picture that comes before your mind's eye.				
	CAI5	The sun as it is sinking below the horizon.	5.54	1.19	0.47	6.66
PRODUCT CATEGORY EXPERIENCE		Indicate your experience with a digital camera in general.				
	CPCE1	How often do you use a digital camera? (9 pt item: Never - Everyday)	4.54	1.95	0.85	5.75
	CPCE3	Overall, how much time have you spent searching for digital camera? (9 pt. item: Very little - Very much)	3.80	2.04	0.61	5.26
BRAND FAMILIARITY		Indicate your familiarity with Kodak digital camera.				
	CBF1	Unfamiliar - Familiar	3.61	2.01	0.81	14.58
	CBF2	Inexperienced - Experienced	3.01	1.76	0.96	19.42
	CBF3	Not knowledgeable - Knowledgeable	3.10	1.79	0.95	19.00

Note: N= 227; Std.: Standardized; CER5 (Aroused - Unaroused), CPCE2 (Do you currently own a digital camera? Yes or No) were deleted during the purification process.

5.2.2. Scale reliability

Since latent constructs with multiple items are reflective, the assessment of the measurement model includes the estimation of internal consistency for reliability (Bollen 1989). Thus, all seven latent constructs with multiple items in this study were tested for internal consistency, using Cronbach's alpha coefficient. The Cronbach's alpha coefficients for all the constructs were higher than the recommended cutoff point of .70 (Nunnally 1978). The alpha coefficient for product category experience for the Kodak digital camera fell just below the cutoff point. Table 11 shows the descriptive statistics of the constructs and Cronbach's alpha coefficients of the scales for both products. Descriptive statistics of cognitive elaboration and attitude accessibility are also shown in the table.

Table 11. Descriptive Statistics and Cronbach's Alphas for Constructs

Constructs	Number of Items	IBM laptop computer			Kodak digital camera		
		Mean	S.D.	α	Mean	S.D.	α
Cognitive Elaboration	Thought listing	4.70	2.43	-	4.66	2.79	-
Mental Imagery	5	4.55	1.14	.91	4.97	1.17	.93
Information Diagnosticity	3	4.92	.94	.84	5.17	.89	.85
Emotional Response	4	3.78	.89	.90	4.66	1.10	.96
Attitude Accessibility	Reaction time method	.88	.28	-	.81	.23	-
Attitude Confidence	3	5.67	.94	.94	5.82	.91	.95
Ability to Imagine	5	4.55	1.14	.78	4.98	.94	.78
Product Category Experience	2	4.68	2.66	.77	4.17	1.74	.68
Brand Familiarity	3	3.15	1.76	.95	3.24	1.74	.93

Note: N = 226 for the IBM laptop computer; N = 227 for the Kodak digital camera.

5.2.3. Construct Validity

Construct validity of the measurement model was examined by convergent validity and discriminant validity. Construct validity is defined as "the extent to which an operationalization measures the concept it is supposed to measure" (Bagozzi, Yi, and Phillips 1991, p. 421). Convergent validity refers to the extent to which the items for a construct act as if they are measuring the underlying construct because they share variance (Schwab 1980), whereas discriminant validity refers to the degree to which items of the two constructs are empirically distinct (Bagozzi, Yi, and Phillips 1991). Empirically, convergent validity is shown when each estimated factor loading on its intended construct is greater than twice its standard error (Anderson and Gerbing 1988). Each factor loading in the measurement model was greater than twice its associated standard error for both IBM laptop computer (.04 - .29) and Kodak digital camera (.05 - .29), suggesting convergent validity.

Discriminant validity is shown when the confidence interval around the estimated correlation between any given two constructs does not include 1.0 (Anderson and Gerbing 1988). The measurement model passed this criterion for both products, suggesting discriminant validity. Further, a more stringent discriminant validity test was performed using a constrained analysis method (Sharma 2000), which involves setting the correlation between one pair of constructs (e.g., mental imagery and emotional response) to unity (1.0) and running the measurement model again. A χ^2 difference test is used to compare the results from the constrained and original model. Discriminant validity is evidenced if the χ^2 difference is significant, thereby, supporting the original model (Anderson and Gerbing 1988). Following this procedure, a total of 21 different

constrained models were run, each time setting to unity the correlation between one pair of the seven constructs. For all 21 pairs, the χ^2 difference was significant ($p < .01$), supporting discriminant validity of the measurement model.

5.2.4. CFA for Attitude Accessibility and Attitude Confidence

An additional CFA was performed to see whether attitude accessibility and attitude confidence were indeed two distinct constructs in this study. The CFA showed that the two factor measurement model fits the data adequately for both products: $\chi^2_{(2)} = 1.95, p = .38$; TLI = 1.00; CFI = 1.00; SRMR = .01, RMSEA = .00 for the IBM laptop computer; $\chi^2_{(2)} = .54, p = .76$; TLI = 1.00; CFI = 1.00; SRMR = .01; RMSEA = .00 for the Kodak digital camera. To further test for the appropriateness of the two factor measurement model, a constrained analysis was conducted, which involved setting the correlation between attitude accessibility and attitude confidence to unity (1.0) and running the model again (Sharma 2000). For both products, the model fit indices worsened significantly (SRMR = .37 for the IBM laptop computer; SRMR = .43 for the Kodak digital camera) and the χ^2 difference tests confirmed ($p < .001$) that the original two factor model is a significantly better fit than a single factor model combining accessibility and confidence.

The two factor measurement model was further tested for the parallelism theorem. The parallelism theorem states that the correlation between two items for two separate constructs is the product of their factor loadings and the correlation between the

constructs (Hunter and Gerbing 1982; Gerbing and Anderson 1988).[6] For this test, the correlation matrix was computed first (Tables 12 and 13). This observed correlation matrix was then compared with the predicted correlation matrix (Tables 14 and 15), which was constructed using the internal consistent theorem[7] and the parallelism theorem. This procedure was repeated for each product. In Tables 14 and 15, predicted correlations are in the lower triangle of the matrix and residuals (the difference between the observed and predicted correlations) are presented in the upper triangle.

Table 12. Observed Correlations (IBM laptop computer)

	LAC1	LAC2	LAC3	LRT
LAC1	1.00			
LAC2	.84	1.00		
LAC3	.84	.84	1.00	
LRT	-.44	-.39	-.42	1.00

Note: N = 226; LAC1, LAC2, and LAC3 are attitude confidence items for the IBM laptop computer; LRT is reaction time score for the IBM laptop computer.

Table 13. Observed Correlations (Kodak digital camera)

	CAC1	CAC2	CAC3	CRT
CAC1	1.00			
CAC2	.87	1.00		
CAC3	.85	.89	1.00	
CRT	-.31	-.30	-.29	1.00

Note: N = 227; CAC1, CAC2, and CAC3 are attitude confidence items for the Kodak digital camera; CRT is reaction time score for the Kodak digital camera.

[6] $r_{XiYk} = r_{XiT} r_{TU} r_{UYk}$, where Xi is an indicator of the construct T and Yk is an indicator of the construct U.

[7] $r_{XiXj} = r_{XiT} r_{XjT}$, where Xi and Xj are two alternate indicators of the construct T.

Table 14. Predicted Correlations and Residuals (IBM laptop computer)

	LAC1	LAC2	LAC3	LRT
LAC1		.00	.00	-.02
LAC2	.84		.00	.03
LAC3	.84	.84		.00
LRT	-.42	-.42	-.42	

Note: N = 226; Factor correlation = -.46; Predicted correlations are in the lower triangle and residuals are in the upper triangle of the matrix.

Table 15. Predicted Correlations and Residuals (Kodak digital camera)

	CAC1	CAC2	CAC3	CRT
CAC1		.00	.00	-.02
CAC2	.87		.00	.00
CAC3	.85	.89		.01
CRT	-.29	-.30	-.30	

Note: N = 227; Factor correlation = -.32; Predicted correlations are in the lower triangle and residuals are in the upper triangle of the matrix.

As shown in Tables 14 and 15, residuals are not substantial in both product conditions. Compared with the predicted correlations, all observed correlations were within the 95% confidence interval.[8] Again, the results confirm that the two factor measurement model is consistent with the data adequately for both products.

Taken together, the above CFA results indicate that attitude accessibility and attitude confidence were distinct constructs in this study, which is consistent with prior research (Berger 1992; Krosnick et al. 1993). Therefore, attitude accessibility and attitude confidence were represented as separate constructs for structural model assessment.

---

[8] $Sr = \frac{1-r^2}{\sqrt{N-1}}$, where Sr is the standard error for the predicted correlation.

5.3. Effects of Presentation Mode on Attitude Accessibility and Attitude Confidence

Prior to testing the structural relationships among the constructs, two-way ANCOVAs were performed to examine the effects of the presentation mode and product type manipulations on attitude accessibility and attitude confidence with product category experience and brand familiarity as two varying covariates. Test results helped determine the appropriateness to test the proposed causal paths among constructs by SEM. For analysis, summated scores were computed and used for latent constructs with multiple items.

Controlling for the two covariates, presentation mode had significant main effects on both attitude accessibility ($F(1, 215) = 21.52, p < .001, \eta^2 = .09$) and attitude confidence ($F(1, 215) = 33.90, p < .001, \eta^2 = .14$). The effects were in predicted directions in that, compared to 2-D participants, 3-D participants accessed their attitude faster ($M_{2D} = .910$ *vs.* $M_{3D} = .790$) and held their attitude more confidently ($M_{2D} = 5.46$ *vs.* $M_{3D} = 6.01$). Unexpectedly, the product type main effect on attitude accessibility was also significant ($F(1, 215) = 7.17, p < .01, \eta^2 = .03$), with participants exposed to the Kodak digital camera holding more accessible attitude than those exposed to the IMB laptop computer ($M_{IBM} = .881$ *vs.* $M_{KODAK} = .819$), controlling for the two covariates. Although not a formal hypothesis here, it is clear that more work is needed to understand what has brought this result. The product type main effect on attitude confidence was not significant ($F(1, 215) = .13, p = .72$), controlling for the two covariates. No significant presentation mode by product type interaction effects were found on either attitude accessibility ($F(1, 215) = .297, p = .59$) or attitude confidence ($F(1, 215) = 2.35, p = .13$).

Table 16 shows adjusted means from the analyses.

Table 16. Adjusted Means for Attitude Accessibility and Attitude Confidence

	Attitude Accessibility		Attitude Confidence	
	2-D	3-D	2-D	3-D
IMB laptop computer	.936	.827	5.43	5.89
Kodak digital camera	.886	.753	5.49	6.14

Note: N = 221; Means adjusted with product category experience and brand familiarity as varying covariates.

5.4. Structural Model Assessment

Following the development of the measurement model adequately fitted to both products and the confirmation of the basic assumption behind this research - 3-D online presentation (and consequent virtual experience) entails more accessible and confident attitude, compared to 2-D online presentation, the researcher then estimated the model parameters along with the fit of the proposed structural model and tested the research hypotheses. Testing of the structural model was conducted separately per product type, using AMOS 4.01. The researcher found no normality problem in the data (Appendix 4).

Specifically, the structural model assessment was performed as follows. First, all constructs in the model were represented as latent variables. Cognitive elaboration and attitude accessibility were represented as single-item latent variables with no measurement error because those constructs were measured via thought listing and reaction time, respectively. For ease of interpretation, reaction time scores were reverse-coded by multiplying by –1 so that a positive path coefficient of attitude accessibility with its antecedent means that the antecedent variable leads to more accessible attitude

(please recall that a small response latency means more accessible attitude). In addition, presentation mode, one of the two experimental factors, was also represented as a single-item construct with no measurement error. Presentation mode was dummy coded: "0" for 2-D, "1" for 3-D. Second, all paths from three exogenous control variables to six endogenous variables were allowed in the model. The researcher also allowed all exogenous variables to covary with one another. Finally, the paths among key model variables were added as hypothesized in the proposed research model. To maintain empirical interpretability of the model, the researcher allowed no path from indicators to the constructs that were not intended to reflect.

The fit indices of the proposed research model indicate an adequate fit with the data: TLI = .93, CFI = .94, SRMR = .05, RMSEA = .06 for the IBM laptop computer; TLI = .95, CFI = .96, SRMR = .04, RMSEA = .05 for the Kodak digital camera (Table 17). The model χ^2 statistics were statistically significant ($\chi^2_{(314)}$= 552.07, $p < .001$ for the IBM laptop computer; $\chi^2_{(314)}$= 522.71, $p < .001$ for the Kodak digital camera), which are expected given the relatively large sample sizes (Kline 1998).

Table 17. Summary of Fit Indices of Proposed Research Model

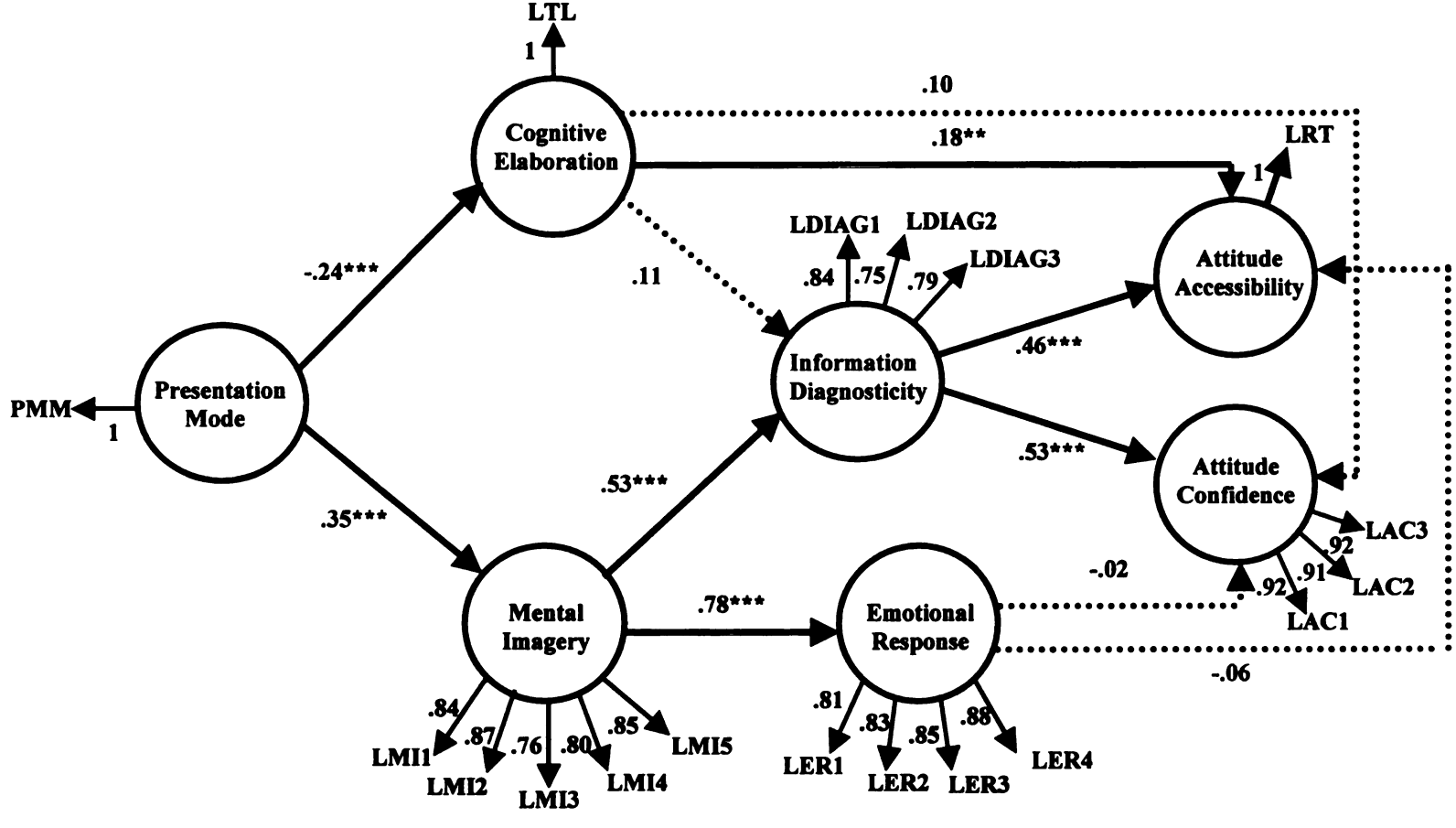
Proposed Research Model	χ^2	*df*	TLI	CFI	SRMR	RMSEA
IBM laptop computer	552.07***	314	.93	.94	.05	.06
Kodak digital camera	522.71***	314	.95	.96	.04	.05

Note: N = 226 for the IBM laptop computer, N = 227 for the Kodak digital camera.
*** $p < .001$.

Figures 2 and 3 show the results of AMOS analysis for the proposed research model with factor loadings and standardized path coefficients with p-values for each

product. All factor loadings are statistically significant, ranging from .48 to .96 for the IBM laptop computer and from .47 to .97 for the Kodak digital camera. For the IBM laptop computer, the proposed research model explained 35 % of the variance in attitude accessibility and 35% of the variance in attitude confidence. For the Kodak digital camera, the research model explained 32% of the variance in attitude accessibility and 63% of the variance in attitude confidence. Notably, despite comparable R^2 values for attitude accessibility between the two products, there was a substantial difference in R^2 values for attitude confidence. Possible reasons for the difference in the explanatory power of the model explaining the variance in confidence are presented in discussion.

Figure 2. Results of Standardized AMOS Analysis for Proposed Research Model (IMB Laptop computer)

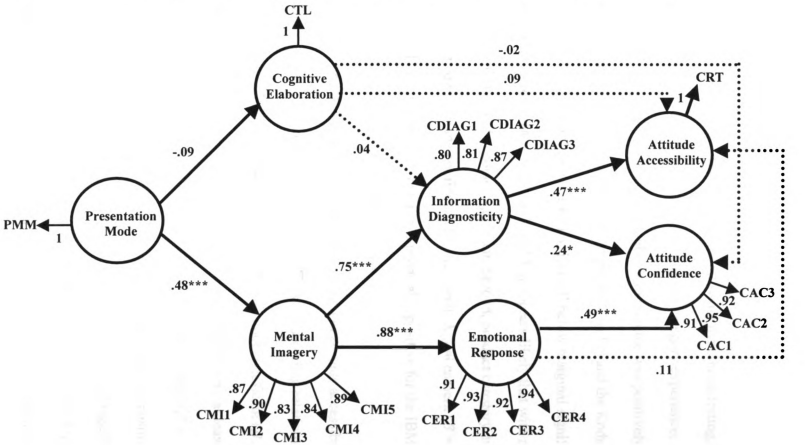


Note: N=226; Solid lines indicate significant paths and dotted lines indicate nonsignificant paths; PMM (Presentation Mode Manipulation), LTL (Thought Listing for IMB laptop computer), LRT (Reaction Time for IMB laptop computer); Presentation Mode, Cognitive Elaboration, and Attitude Accessibility are represented as single-item latent variables with perfect measurement; Control variables and disturbance terms are not shown for simplicity.

** $p < .01$, *** $p < .001$

$\chi^2_{(314)} = 552.07$, $p < .001$; TLI =.93; CFI =.94; SRMR =.05; RMSEA =.06

Figure 3. Results of Standardized AMOS Analysis for Proposed Research Model (Kodak digital camera)



Note: N=227; Solid lines indicate significant paths and dotted lines indicate nonsignificant paths; PMM (Presentation Mode Manipulation), CTL (Thought Listing for Kodak digital camera), CRT (Reaction Time for Kodak digital camera); Presentation Mode, Cognitive Elaboration, and Attitude Accessibility are represented as single-item latent variables with perfect measurement; Control variables and disturbance terms are not shown for simplicity.

* $p < .05$, *** $p < .001$

$\chi^2_{(314)} = 522.71$, $p < .001$; TLI = .95; CFI =.96; SRMR =.04; RMSEA =.05

5.5. Hypothesis Testing

Control Variables

All the relationships described in the following hypothesis testing, except for H1 and H2, were tested with ability to imagine, product category experience, and brand familiarity as controls. First, as expected, ability to imagine was positively related to mental imagery for both the IBM laptop computer (β = .12) and the Kodak digital camera (β = .10), but barely approached or just fell below marginal significance for both products (p = .10 for IBM; p = .14 for Kodak). It appears likely that with a larger sample, these relationships would become significant. Second, product category experience was positively related to attitude confidence for the Kodak digital camera (β = .20, p < .01), as expected. The corresponding relationship was also positive for the IBM laptop computer, but was not significant (β = .05, p = .49).

Lastly, brand familiarity was positively related to attitude accessibility for the IBM laptop computer only (β = .16, p < .05). The corresponding relationship in the Kodak digital camera model also was positive, but was not significant (β = .02, p = .68). The path coefficient from brand familiarity to mental imagery was, at least marginally, significant and positive for both IBM (β = .14, p < .10) and Kodak (β = .19, p < .01). In addition, the path from brand familiarity to attitude confidence was positive but trivial for both IBM (β = .06) and Kodak (β = .09) and approached marginal significance for only Kodak (p < .10). Unexpectedly, brand familiarity was positively related to cognitive elaboration for the IBM laptop computer (β = .19, p < .01). Although not a formal hypothesis here, more work is needed for better understanding of this unexpected

relationship.

The results of hypothesis testing are presented below. Table 18 summarizes the results.

H1: Effect of Presentation Mode on Cognitive Elaboration

H1 predicted that 3-D participants will engage in more product-relevant cognitive responding than 2-D participants. As shown in Table 18, presentation mode was significantly related to cognitive elaboration for the IBM laptop, but the direction of the effect was the opposite of what was predicted (β = -.24, p < .001),[9] indicating that 3-D participants engaged less in product-relevant cognitive responding than 2-D participants. For the Kodak digital camera, the path from presentation mode on cognitive elaboration also was negative, but did not approach significance (β = -.09, p = .19). Thus, H1 was not supported.

H2: Effect of Presentation Mode on Mental Imagery

H2 predicted that 3-D participants will have more vivid mental imagery than 2-D participants. As expected, presentation mode was positively related to mental imagery for both the IBM laptop computer (β = .35, p < .001) and the Kodak digital camera (β = .48, p < .001), thus supporting H2. Therefore, those in the 3-D condition had more vivid mental imagery about the product than those in the 2-D condition, regardless of product type.

---

[9] Presentation mode was dummy coded as "0" for the 2-D conditions and "1" for the 3-D conditions.

H3: Effect of Mental Imagery on Emotional Responses

H3 hypothesized that vivid mental imagery will evoke higher levels of emotional responses. As expected, vivid mental imagery elicited stronger emotional responses for both the IBM laptop computer ($\beta = .78, p < .001$) and the Kodak digital camera ($\beta = .88$, $p < .001$). Thus, H3 was supported.

H4: Effect of Cognitive Elaboration on Diagnostitcity of Product Information

H4 predicted that cognitive elaboration will be positively associated with diagnosticity of product information acquired. Although the signs of the path coefficients were in predicted directions for both products, they failed to reach significance at the .05 level ($\beta = .11, p = .08$ for the IBM laptop computer; $\beta = .04, p = .44$ for the Kodak digital camera). Thus, H4 was not supported.

H5: Effect of Mental Imagery on Diagnosticity of Information

H5 predicted that mental imagery will be positively associated with diagnosticity of product information. Results show that mental imagery had a positive effect on information diagnosticity for both the IBM laptop computer ($\beta = .53, p < .001$) and the Kodak digital camera ($\beta = .75, p < .001$), as hypothesized. Thus H5 was supported.

H6a & H6b: Effects of Information Diagnosticity on Attitude Accessibility and Attitude Confidence

This set of hypotheses assumed that higher level of information diagnosticity will lead to more accessible and more confident attitude. As predicted, information

diagnosticity was positively associated with attitude accessibility for both the IBM laptop computer ($\beta = .46, p < .001$) and the Kodak digital camera ($\beta = .47, p < .001$). As previously mentioned, reaction time scores were reverse-coded by multiplying by –1 for the AMOS analysis. Thus, the positive path coefficients suggest that higher level of information diagnosticity leads to more accessible attitude for both products.

Information diagnosticity was also positively associated with attitude confidence for both the IBM laptop computer ($\beta = .53, p < .001$) and the Kodak digital camera ($\beta = .24, p < .05$). H6a and H6b were, therefore, supported.

H7a & H7b: Moderating Role of Product Type for the Cognitive Elaboration-Accessibility Link and for the Cognitive Elaboration-Confidence Link

This set of hypotheses predicted that cognitive elaboration will have a stronger influence on attitude accessibility (H7a) and attitude confidence (H7b) for the utilitarian product (i.e., the IBM laptop computer) than for the hedonic product (i.e., the Kodak digital camera). As hypothesized, noticeable differences were found in the relationships between cognitive elaboration and attitude accessibility, and attitude confidence, depending on product type.

As hypothesized, a noticeable difference was found in the relationship between cognitive elaboration and attitude accessibility, depending on product type. Specifically, the effect of cognitive elaboration on attitude accessibility was significant and positive only for the utilitarian product ($\beta = .18, p < .01$), whereas the corresponding effect was not significant for the hedonic product ($\beta = .09, p = .13$), thus providing evidence for H7a. Product type, however, did not moderate the relationship between cognitive

elaboration and attitude confidence. Although the sign of the coefficient was in the predicted direction for the utilitarian product, it failed to reach significant at the .05 level ($\beta = .10, p = .10$). The corresponding relationship was not significant for the hedonic product ($\beta = -.02, p = .73$). These results suggest that, as far as the relationship between cognitive elaboration and attitude confidence is concerned, product type is not a significant moderator. Thus, H7b was not supported.

H8a & H8b: Moderating Role of Product Type for the Emotional Response – Accessibility Link and for the Emotional Response-Confidence Link

This set of hypotheses is in contrast to what the previous set of hypotheses predicted: they predicted that the effects of emotional response on attitude accessibility and attitude confidence will be more pronounced for the hedonic product than for the utilitarian product. There was a noticeable difference in the relationship between emotional response and attitude confidence, depending on product type. For the hedonic product, the effect of emotional response on confidence was positive and significant ($\beta = .49, p < .001$), but was not significant for the utilitarian product ($\beta = -.02, p = .80$), thus providing support for H8b.

The moderating role of product type, however, was not detected for the relation between emotional response and attitude accessibility. In fact, the paths from emotional response to confidence were not significant for both the utilitarian ($\beta = -.06, p = .46$) and hedonic products ($\beta = .11, p = .41$). Thus, H8a was not supported.

Table 18. Results of Hypothesis Testing

Hypothesis	Path Description	Hypothesized Direction	Std. Path Coefficient		Result
			IBM	Kodak	
H1	Presentation Mode → Cognitive Elaboration	(+)	-.24***	-.09	Not supported
H2	Presentation Mode → Mental Imagery	(+)	.35***	.48***	Supported
H3	Mental Imagery → Emotional Response	(+)	.78***	.88***	Supported
H4	Cognitive Elaboration → Diagnosticity	(+)	.11	.04	Not supported
H5	Mental Imagery → Diagnosticity	(+)	.53***	.75***	Supported
H6a	Diagnosticity → Accessibility	(+)	.46***	.47***	Supported
H6b	Diagnosticity → Confidence	(+)	.53***	.24*	Supported
H7a	Cognitive Elaboration → Accessibility	Utilitarian > Hedonic	.18**	.09	Supported
H7b	Cognitive Elaboration → Confidence	Utilitarian > Hedonic	.10	-.02	Not supported
H8a	Emotional Response → Accessibility	Utilitarian < Hedonic	-.06	.11	Not supported
H8b	Emotional Response → Confidence	Utilitarian < Hedonic	-.02	.49***	Supported

Note: * $p < .05$, ** $p < .01$, *** $p <. .001$

5.6. Decomposition of Effects

All the significant relationships observed were decomposed into direct, indirect, and total effects for further analysis. One of the main advantages of causal analysis such as SEM and regular path analysis is that it enables one to decompose the relationship between any two variables into a sum of direct and indirect paths with some of these indirect paths being substantially meaningful and others not (i.e., nonsignificance) (Asher 1983).

The basic impetus behind this research was to illuminate causal processes by which the presentation mode manipulation influences attitude accessibility and confidence. And the SEM analysis results show that the presentation mode manipulation had no significant direct effects on accessibility and confidence for both products. Therefore, decomposition analysis was focused on whether differences in mediator variables initially induced by the presentation mode manipulation would be actually transmitted to differential levels of accessibility and confidence (i.e., indirect paths from presentation mode to accessibility and confidence in the proposed research model). To facilitate comparisons, standardized path coefficients were used throughout for analysis. Results are shown in Table 19 and 20.

In Tables 19 and 20, total effects were simply the sum of all the direct and indirect effects of one variable on another. Indirect effects were the product of relevant path coefficients. A significance of indirect effects involving three variables (e.g., X → $Y_1 \rightarrow Y_2$) was tested by a *Z* test with the following formulas (Baron and Kenny 1986; Kline 1998, p. 150).

$$z = \frac{axb}{SE_{ab}}$$

where $$SE_{ab} = \sqrt{b^2 SE_a^2 + a^2 SE_b^2 + SE_a^2 SE_b^2}$$

a = path coefficient between X and Y_1
b = path coefficient between Y_1 and Y_2
SE = standard error

For complex indirect effects with more than four variables, the indirect effect was taken as significant if all of its component path coefficients are significant (Kline 1998,

p.150).

Table 19 summarizes the results of effects decomposition in the IBM laptop computer model. Here, presentation mode had a significant negative indirect effect on accessibility through cognitive elaboration. Substantively, this implies 2-D participants engaged in more elaborated cognitive responding than 3-D participants, which, in turn, was transformed to more accessible attitude for 2-D participants. This contradicts what was hypothesized. The size of this indirect effect, however, was trivial (-.04), and its contribution to 2-D participants' accessibility was offset completely by a stronger positive indirect influence of presentation mode on accessibility (.08) through imagery and diagnosticity, resulting in a positive total effect of presentation mode on accessibility (.04). The other indirect effects of presentation mode on accessibility and confidence, via either cognitive elaboration or cognitive elaboration and diagnosticity, were negligible and not significant.

As expected, mental imagery mediated the effect of presentation mode to diagnosticity that was a strong predictor for both accessibility and confidence. All the path coefficients involved in these causal links were substantial and positive, resulting in significant, positive, indirect effects of presentation mode on accessibility (.08) and confidence (.10). Mental imagery also mediated the effect of presentation mode on emotional response that was a nonsignificant predictor for accessibility and confidence. The nonsignificant relationships between emotional response and accessibility, and confidence, produced a break in these continuous paths from presentation mode to accessibility, and to confidence.

The decomposition results for the Kodak digital camera are summarized in Table

20. None of the effects of presentation mode on accessibility and confidence were mediated by either cognitive elaboration or cognitive elaboration and diagnosticity. On the other hand, mental imagery mediated the effect of presentation mode on diagnosticity that was a reliable predictor for both accessibility and confidence. All the path coefficients involved in these causal links were substantial and positive, resulting in significant, positive, indirect effects of presentation mode on accessibility (.17) and confidence (.09). Although the size of the path coefficient from diagnosticity to confidence (.24) may be questioned as not substantial, it did not break the continuous path from presentation mode to confidence.

Mental imagery also mediated the effect of presentation mode on emotional response that was a strong predictor of confidence. All the path coefficients involved in this causal link were substantial and positive, resulting in a significant, positive, indirect effect of presentation mode on confidence (.20). The indirect effect of presentation mode on accessibility via mental imagery and emotional response was not significant, however, due to the break-up between emotional response and accessibility in that link.

Table 19. Decomposition of Standardized Effects of Proposed Research Model (IBM laptop computer)

	Endogenous Variable					
Predictor Variable	Cognitive elaboration	Mental imagery	Information diagnosticity	Emotional response	Attitude accessibility	Attitude confidence
Presentation mode						
Direct effect	−.24	.35	-	-	-	-
Indirect via cognitive elaboration	-	-	n.s.	-	−.04	n.s.
Indirect effect via cognitive elaboration & information diagnosticity	-	-	-	-	n.s.	n.s.
Indirect effect via mental imagery	-	-	.19	.27	-	-
Indirect effect via mental imagery & information diagnosticity	-	-	-	-	.08	.10
Indirect effect via mental imagery & emotional response	-	-	-	-	n.s.	n.s.
Total effect	−.24	.35	.19	.27	.04	.10
Cognitive elaboration						
Direct effect	-	-	n.s.	-	.18	n.s.
Indirect via information diagnosticity	-	-	-	-	n.s.	n.s.
Total effect	-	-	.00	-	.18	.00
Mental Imagery						
Direct effect	-	-	.53	.78	-	-
Indirect effect via information diagnosticity	-	-	-	-	.24	.28
Indirect via emotional response	-	-	-	-	n.s.	n.s.
Total effect	-	-	.53	.78	.24	.28
Information diagnosticity						
Direct effect (Total effect)	-	-	-	-	.46	.53
Emotional response						
Direct effect (Total effect)	-	-	-	-	n.s.	n.s.
Control Variables						
Ability to imagine	n.s	n.s.	n.s.	n.s.	n.s.	n.s.
Product category experience	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Brand familiarity	.19	n.s.	n.s.	n.s.	.16	n.s.

Note: All the coefficients are significant at $\alpha = .05$ level; n.s.: not significant at $\alpha = .05$ level.

Table 20. Decomposition of Standardized Effects of Proposed Research Model (Kodak digital camera)

	Endogenous Variable					
Predictor Variable	Cognitive elaboration	Mental imagery	Information diagnosticity	Emotional response	Attitude accessibility	Attitude confidence
Presentation mode						
Direct effect	n.s.	.48	-	-	-	-
Indirect via cognitive elaboration	-	-	n.s.	-	n.s.	n.s.
Indirect effect via cognitive elaboration & information diagnosticity	-	-	-	-	n.s.	n.s.
Indirect effect via mental imagery	-	-	.36	.42	-	-
Indirect effect via mental imagery & information diagnosticity	-	-	-	-	.17	.09
Indirect effect via mental imagery & emotional response	-	-	-	-	n.s.	.20
Total effect	.00	.48	.36	.42	.17	.29
Cognitive elaboration						
Direct effect	-	-	n.s.	-	n.s.	n.s.
Indirect via information diagnosticity	-	-	-	-	n.s.	n.s.
Total effect	-	-	.00	-	.00	.00
Mental imagery						
Direct effect	-	-	.75	.88	-	-
Indirect effect via information diagnosticity	-	-	-	-	.36	.18
Indirect via emotional response	-	-	-	-	n.s.	.43
Total effect	-	-	.75	.88	.36	.61
Information diagnosticity						
Direct effect (Total effect)	-	-	-	-	.47	.24
Emotional response						
Direct effect (Total effect)	-	-	-	-	n.s.	.49
Control Variables						
Ability to imagine	n.s	n.s.	n.s.	n.s.	n.s.	n.s.
Product category experience	n.s.	n.s.	n.s.	n.s.	n.s.	.20
Brand familiarity	n.s.	.19	n.s.	n.s.	n.s.	n.s.

Note: All the coefficients are significant at least $\alpha = .05$ level; n.s.: not significant at $\alpha = .05$ level.

Chapter 6. Discussion and Conclusion

This dissertation proposed and tested a dual processing model of virtual experience, in which discursive processing and experiential processing modes are united in an integrated framework as they influence online consumers' brand attitude strength, specifically, attitude accessibility and attitude confidence. At the operational level, cognitive elaboration was posited to represent the discursive processing aspect, whereas mental imagery and imagery-evoked emotions represent the experiential aspects of virtual experience. Specifically, this research was aimed to provide answers for three testable propositions: (i) 3-D product presentation online (and consequent virtual experience) leads more accessible and confident brand attitude than 2-D product presentation online; (ii) there exist two distinct causal processes underlying those effects; and (iii) product type (utilitarian *vs.* hedonic) plays an important role determining the relative contribution of each process to the two attitude strength dimensions.

6.1. Effects of Virtual Experience on Attitude Accessibility and Attitude Confidence

Findings lend support for the first proposition. Attitude was significantly stronger for 3-D participants than 2-D participants in terms of both attitude accessibility and confidence, regardless of product type. These findings are important, given the proven impact of these attitude strength dimensions on the attitude-behavior relationship: accessible and confident attitudes guide actual behavior (Berger and Mitchell 1989; Fazio, Powell, and Williams 1989; Fazio and Zanna 1978a, 1978b; Smith and Swinyard 1983).

Taken together, this lends credence to the notion that brand attitudes formed via 3-D product visualization are readily accessible and held with greater confidence, thereby, fostering attitudinally consistent purchase behavior, than brand attitudes formed via product exposure in a static 2-D format.

The causal processes by which 3-D product visualization leads more accessible and confident attitude are explained in the following section.

6.2. Role of Discursive and Experiential Processing in Mediating Virtual Experience Effects

Findings also are supportive of the dual processing modes of virtual experience. Cognitive elaboration, representing discursive processing, mediated the effect of the presentation mode manipulation to accessibility for the utilitarian product. Cognitive elaboration also mediated the effect of the presentation mode manipulation to confidence for the utilitarian product, but this presentation mode – cognitive elaboration – confidence link failed to reach significance at the .05 level ($p = .12$). With a larger sample, it appears likely that this continuous path also becomes significant. These discursive processes, however, were not present for the hedonic product.

Mental imagery and imagery-evoked emotions, representing experiential processing, also proved to mediate differences created by the presentation mode manipulation to confidence for the hedonic product. The path from emotional response to accessibility, however, was not significant, thus producing a break in this continuous path from presentation mode to accessibility. It remains unclear what may have caused the null finding. Clearly, more work is necessary for better understanding of this observation. The

causal link representing such experiential processing, however, was not detected for the utilitarian product. Nevertheless, these results generally support the existence of two distinct processing modes of virtual experience regarding the strength of brand attitude, despite some variations depending on product type, which will be discussed in the section 6.3.

It should be noted that the significant relationship between presentation mode and cognitive elaboration found for the utilitarian product was negative, which was completely opposite of the predicted effect. This finding was also contrasted with the nonsignificance of the corresponding relationship for the hedonic product. A possible explanation exists for this unexpected result. Although speculative, it can be argued that in the face with various interactive features of the interface, 3-D participants may have been distracted, with their attention being turned away from processing information in a more analytical manner. In contrast, 2-D participants had no such a distractor. A theoretical ground for this speculation can be found in the literature on information overload (Jacoby, Speller, and Kohn 1974) and limited capacity of information processing (Lang 2000). According to these theories, an individual's cognitive capacity in processing information is limited. Thus, as demand from the "primary" task commanding attention increases, fewer resources should be allocated to "secondary" tasks, inhibiting elaborative processing of them. In the context of this study, it is reasoned that, as participants are drawn to salient 3-D features and immersed into mental imagery, the amount of capacity allocated to process information in a discursive fashion is reduced, resulting in less cognitive responding for 3-D participants, than for 2-D participants.

Cost for such reduction in processing capacity should be greater for the utilitarian

product in which the consumer's rational assessment about the functional utility of the product is crucial, than for the hedonic product for which such discursive processing is of less value. This logic is also consistent with the finding that 3-D presentation is inferior to 2-D presentation in fostering cognitive elaboration when a user approaches a web site to gather facts rather than to be entertained (Schlosser 2003).

6.3. Moderating Role of Utilitarian and Hedonic Product Types

The final goal of this study was to delineate a boundary condition on the relative strength of discursive processing *vs.* experiential processing. For that purpose, an idea of classifying products into utilitarian and hedonic was introduced as a possible moderator. Specifically, it was hypothesized that a stronger relationship would exit between cognitive elaboration and accessibility, and confidence, for the utilitarian product, rather than for the hedonic product. In contrast, a stronger relationship was expected to occur between imagery-evoked emotions and accessibility, and confidence, for the hedonic product, rather than the utilitarian product.

Results lend support for such moderating roles of product type. In the discursive processing side, cognitive elaboration mediated the effect of presentation mode to accessibility for the utilitarian product, whereas cognitive elaboration was a nonfactor for any subsequent processing for the hedonic product. In the experiential processing side, imagery-induced emotional response was a major determinant of attitude confidence for the hedonic product, whereas such emotion had no bearing on attitude strength for the utilitarian product.

It should be noted, however, that experiential processing dominated over

discursive processing, regardless of product type: mental imagery not only mediated the effect of presentation mode to emotional response that was a strong predictor of confidence for the hedonic product, but transmitted the effect of presentation mode to diagnosticity that was a reliable antecedent to both accessibility and confidence across product types. The only notable observation in discursive processing was the mediating role of cognitive elaboration on accessibility in the utilitarian product model, but this causal link was rather weak, despite its significance. In fact, this discursive process was offset completely by a positive indirect effect through mental imagery and diagnosticity. Overall, these findings highlight the importance of experiential processing of virtual experience with respect to attitude strength, regardless of product type.

6.4. Other Significant Findings

Another major finding of this research is the robustness of information diagnosticity as a critical mediator for the relation between mental imagery and the strength of brand attitude, regardless of product type. It is reasoned that mental imagery enables consumers to vicariously experience the product in imagined episodes, thus providing an added opportunity for them to elaborate on possible consequences of using it. This added opportunity to deliberate on pros and cons of the product in use should render acquired product information more reliable and diagnostic as an inferential basis, thus making the resulting attitude more accessible and more confident. The results of this study clearly suggests that information diagnosticity is a central construct in the dual processing model of virtual experience and should be measured and examined in virtual experience studies.

Another point worth noting is the substantial difference between the two product types in R^2 values of the research model for attitude confidence. The proposed research model explained approximately twice as much variance in attitude confidence for the hedonic product (63%) than for the utilitarian product (35%). For the hedonic product, mental imagery worked through both diagnosticity and emotional response to influence confidence whereas mental imagery worked through only diagnosticity to affect confidence for the utilitarian product.

As might be expected, the presence of this additional path for the hedonic product (or the absence of the path for the utilitarian product) appears responsible for the difference observed in the explanatory power of the research model by product type. In addition, as shown in Table 20, in the hedonic product model, attitude confidence was significantly influenced by product category experience - a control variable of the study, thereby, boosting an overall R^2 value of the model. In the utilitarian model, none of the control variables were significantly related to attitude confidence (Table 19). R^2 values for attitude accessibility were comparable across product types: R^2 values were 35% and 32% for the utilitarian and hedonic products, respectively.

6.5. Contributions

This study has several important implications. For advertising researchers, this study contributes to extant 3-D literature by proposing two dimensions of attitude strength, attitude accessibility and attitude confidence in particular, as new effectiveness measures of 3-D product visualization. Coupled with the literature endorsing these dimensions' impacts on attitude-behavior consistency, this research suggests the

possibility that virtual product experience fostered by interactive and vivid 3-D product visualization can emulate the outcomes anticipated under direct product experience.

This study also specifies important processing variables of virtual experience with respect to accessibility and confidence and provides an initial attempt to understand their structural relationships. Perhaps the most important theoretical contribution of this study is that this research proposed and empirically tested the validity of the dual processing model of virtual experience employing products that differ in perceived functionality. Results generally supported the existence of the modeled relationships: (i) discursive processing and experiential processing modes indeed operate to mediate the effects of virtual experience to the strength of attitude, despite the dominance of experiential processing mode; and (ii) the relative influence of each processing mode on attitude strength depends on the nature of the product being examined.

For online advertisers and marketers, this study offers a convincing argument for the viability of this innovative technology. Apparently, inducing a positive brand attitude is not of itself sufficient to substantially influence purchase behavior. Prior research on attitude accessibility and confidence strongly suggests that if the goal of advertising is to affect purchase behavior, advertisers and marketers should be also concerned with the development of accessible and confident attitudes (Herr and Fazio 1993). Findings from this study suggest that 3-D product visualization is one way to achieve that objective.

Another important practical implication is the suggestion that any benefits of virtual experience may be qualified for utilitarian products. For those products, virtual experience may function to inhibit cognitive responding of users, which eventually makes their attitude less strong than otherwise would be the case. However, this is not to suggest

in any way that 3-D visualization needs to be completely discarded for this type of product. Rather, considering the stronger benefits of 3-D visualization on attitude strength through experiential processing, a better solution would be to display 3-D products via a separate link or present them in sequential order after presentation of textual information, so that potential distraction can be minimized.

6.6. Limitations and Future Research

This study has a few limitations and recommendations elicited from those limitations. First, there is a possibility that the moderating effects of product type are confounded by uncontrolled aspects of the test products other than the perceived utility (i.e., whether the product is utilitarian or hedonic). For example, price was not controlled across the two product conditions. Price is an important factor in product evaluation (Rao and Sieben 1992) and in the probability of perceived risk, especially, financial risk (Grewal, Gotlieb, and Marmorstein 1994). In fact, in this study, the IBM laptop computer model was priced substantially higher than the Kodak digital camera model ($1399.95 *vs.* $299.95) to make the stimulus materials appear more realistic. Although this made the online ads more real, it may have caused participants to perceive the test products different in terms of perceived risks, thus creating a possible confound. Future research might attempt to try to control extraneous variables such as price and risk. Thereby, two product conditions would differ only in terms of their perceived utility, thus minimizing the potential sources of extraneous variation.

In addition, the possibility exists that the thought-listing procedure used in this study may not be totally confound-free. Despite its popularity as a measure of cognitive

elaboration (Cacioppo and Petty 1979), sometimes whether a listed thought is derived from a verbally driven cognitive activity or from an imagined episode is unclear (MacInnis and Price 1987). In other words, a listed thought, although verbally represented, still may be elicited from a mental image. And to the extent that this happens, the measure is confounded. Future studies might attempt to try control this extraneous variation by employing protocol analysis techniques, which can capture participants' cognitive response concurrently with their exposure to stimuli.

Another limitation of the study is that in this study, product information was conveyed only through a single sensory dimension – sight. This constraint with respect to sensory inputs may have mitigated the effects of 3-D product visualization. For example, adding sound may enhance the effects of 3-D product visualization especially for products where sound is an important attribute (Schlosser 2003). Future research may examine the effect of 3-D visualization with varying degrees of sensory inputs (sight only *vs.* sight plus sound) on the strength of attitudes.

Another interesting avenue for future research is to examine the effects of virtual experience in conjunction with textual information. The focus of this study was to explore how initial differences induced by two online product presentation styles (2-D *vs.* 3-D) are carried over to the strength of brand attitude. So, both quantity and quality of textual information in stimulus web sites were controlled across the conditions. However, considering a critical role of ad copy playing in ad information processing (Petty, Cacioppo, and Schumann 1983), future research may benefit from incorporating both quantity and quality of textual information as experimental factors in combination with online presentation mode. This avenue of research would help clarify possible

interactions between them.

In conclusion, while prior studies are concerned about either discursive or experiential aspects of online experience, there has been a lack of integrative frameworks that combine the various theories and findings from the two research streams. This study represents an initial attempt to develop such a framework. Specifically, this study demonstrated the existence of two distinct processing modes in mediating the effects of virtual experience to attitude accessibility and confidence and, more importantly, highlighted the importance of experiential processing. Future research should be conducted to fill the gaps of the processes left unexplained. By then we will have a more complete understanding of what can be accomplished by this innovative but unexplored area of virtual experience.

REFERENCES

Aaker, David A., Douglas M. Stayman, and Michael R. Hagerty (1986), "Warmth in Advertising: Measurement, Impact and Sequence Effects," *Journal of Consumer Research*, 12 (March), 365-381.

Ajzen, Icek and Martin Fishbein (1980), "Predicting and Understanding Consumer Behavior: Attitude-Behavior Correspondence," in *Understanding Attitudes and Predicting Social Behavior*, Englewood Cliffs, NJ: Prentice-Hall, 148-172.

Alba, Joseph W. and J. Wesley Hutchinson (1987), "Dimensions of Consumer Expertise," *Journal of Consumer Research*, 13 (March), 411-454.

Anderson, James C. and David W. Gerbing (1984), "The Effects of Sampling Error on Convergence, Improper Solutions, and Goodness-of-Fit Indices for Maximum Likelihood Confirmatory Factor Analysis," *Psychometrika*, 49, 155-173.

---- (1988), "Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach," *Psychological Bulletin*, 103 (3), 411-423.

Ariely, Dan (2000), "Controlling the Information Flow: Effects on Consumers' Decision Making and Preferences," *Journal of Consumer Research*, 27 (September), 233-248.

Asher, Herbert B. (1983), *Causal Modeling,* (2nd ed.), Newbury Park: Sage.

Babin, Barry J., William R. Darden, and Mitch Griffin (1994), "Work and/or Fun: Measuring Hedonic and Utilitarian Shopping Value," *Journal of Consumer Research*, 20 (March), 644-656.

Babin, Laurie A. and Alvin C. Burns (1997), "Effects of Print Ad Pictures and Copy Containing Instructions to Imagine on Mental Imagery That Mediates Attitudes," *Journal of Advertising*, 26 (3), 33-44.

Baddeley, Alan D. (1986), *Working Memory*, New York: Oxford University Press.

Bagozzi, Richard P. and Youjae Yi (1989), "The Degree of Intention Formation as a Moderator of the Attitude-Behavior Relationship," *Social Psychological Quarterly*, 52 (4), 266-279.

Bagozzi, Richard P., Youjae Yi, and Lynn W. Phillips (1991), "Assessing Construct Validity in Organizational Research," *Administrative Science Quarterly*, 36 (3), 421-458.

Baron, Reuben M. and David A. Kenny (1986), "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology*, 51 (6), 1173-1182.

Bassili, John N. (1993), "Response Latency versus Certainty as Indices of the Strength of Voting Intentions in a CATI Survey," *Public Opinion Quarterly*, 57 (1), 54-61.

Batra, Rajeev and Olli T. Ahtola (1990), "Measuring the Hedonic and Utilitarian Sources of Consumer Attitudes," *Marketing Letters*, 2 (2), 159-170.

Batra, Rajeev and Michael L. Ray (1985), "How Advertising Works at Contact," in *Psychological Processes and Advertising Effects,* Linda F. Alwitt and Andrew A. Mitchell, eds., Hillsdale, NJ: Lawrence Erlbaum Associates, 13-44.

---- (1986), "Affective Responses Mediating Acceptance of Advertising," *Journal of Consumer Research*, 13 (September), 234-249.

Bennett, Peter D. and Gilbert D. Harrell (1975), "The Role of Confidence in Understanding and Predicting Buyers' Attitudes and Purchase Intentions," *Journal of Consumer Research*, 2 (September), 110-117.

Bentler, Peter M. and Chi-Ping Chou (1987), "Practical Issues in Structural Modeling," *Sociological Methods and Research*, 16 (78-117).

Berger, Ida E. (1992), "The Nature of Attitude Accessibility and Attitude Confidence: A Triangulated Experiment," *Journal of Consumer Psychology*, 1 (2), 103-123.

Berger, Ida E. and Andrew A. Mitchell (1989), "The Effect of Advertising on Attitude Accessibility, Attitude Confidence, and the Attitude-Behavior Relationship," *Journal of Consumer Research*, 16 (December), 269-279.

Bettman, James R. (1979), "Memory Factors in Consume Choice: A Review," *Journal of Marketing*, 43, 37-53.

Betts, George Herbert (1909), *The Distribution and Functions of Mental Imagery*, New York: Columbia University Teachers College.

Biocca, Frank (1992), "Communication within Virtual Reality: Creating a Space for Research," *Journal of Communication*, 42 (4), 5-22.

Bollen, Kenneth A. (1989), *Structural Equations Modeling with Latent Variables*, New York: John Wiley & Sons.

Bone, Paula Fitzgerald and Pam Scholder Ellen (1992), "The Generation and Consequences of Communication-Evoked Imagery," *Journal of Consumer Research*, 19 (June), 93-104.

Brock, Timothy C. and Sharon Shavitt (1983), "Cognitive-Response Analysis in Advertising," in *Advertising and Consumer Psychology,* Larry Percy and Arch G. Woodside, eds., Lexington, MA: Lexington Books, 91-116.

Burke, Marian C. and Julie A. Edell (1989), "The Impact of Feelings on Ad-Based Affect and Cognition," *Journal of Marketing Research*, 26 (February), 69-83.

Burns, Alvin C., Abhijit Biswas, and Laurie A. Babin (1993), "The Operation of Visual Imagery as a Mediator of Advertising Effects," *Journal of Advertising*, 22 (2), 71-85.

Cacioppo, John T. and Richard E. Petty (1979), "Effects of Message Repetition and Position on Cognitive Responses, Recall, and Persuasion," *Journal of Personality and Social Psychology*, 37 (1), 97-109.

---- (1981), "Social Psychological Procedures for Cognitive Response Assessment: The Thought-Listing Technique," in *Cognitive Assessment,* Carol R. Glass, Thomas V. Merluzzi, and Myles Genest, eds., New York: Guilford Press, 309-342.

Celci, Richard L. and Jerry C. Olson (1988), "The Role of Involvement in Attention and Comprehension Processes," *Journal of Consumer Research*, 15 (September), 210-224.

Chaiken, Shelly (1980), "Heuristic versus Systematic Information Processing and the Use of Source versus Message Cues in Persuasion," *Journal of Personality and Social Psychology*, 39 (5), 752-766.

Chaiken, Shelly and Alice H. Eagly (1983), "Communication Modality as a Determinant of Message Persuasiveness and Message Comprehensibility," *Journal of Personality and Social Psychology*, 45 (2), 241-256.

Chaudhuri, Arjun and Morris B. Holbrook (2001), "The Chain of Effects from Brand Trust and Brand Affect to Brand Performance: The Role of Brand Loyalty," *Journal of Marketing*, 65 (April), 81-93.

Coyle, James R. and Esther Thorson (2001), "The Effects of Progressive Levels of Interactivity and Vividness in Web Marketing Sites," *Journal of Advertising*, 30 (3), 65-77.

Dhar, Ravi and Klaus Wertenbroch (2000), "Consumer Choice between Hedonic and Utilitarian Goods," *Journal of Marketing Research*, 37 (February), 60-71.

Doll, Jorg and Icek Ajzen (1992), "Accessibility and Stability of Predictors in the Theory of Planned Behavior," *Journal of Personality and Social Psychology*, 63 (5), 754-765.

Edell, Julie A. and Marian C. Burke (1987), "The Power of Feelings in Understanding Advertising Effects," *Journal of Consumer Research*, 14 (December), 421-433.

Edwards, Steven M. and Harshavardhan Gangadharbatla (2001), "The Novelty of 3D Product Presentations Online," *Journal of Interactive Advertising*, 2 (1), [www.jiad.org].

Edwards, Steven M. and Carrie La Ferle (2003), "Role-Taking: Enhancing the Online Experience," *Journal of Current Issues and Research in Advertising*, 25 (2), 45-56.

Einhorn, Hiller J. and Robin M. Hogarth (1978), "Confidence in Judgment: Persistence of the Illusion of Validity," *Psychological Review*, 85 (5), 395-416.

Epstein, Seymour (1994), "Integration of the Cognitive and the Psychodynamic Unconscious," *American Psychologist*, 48 (8), 709-724.

Escalas, Jennifer Edson (2004), "Imagine Yourself in the Product," *Journal of Advertising*, 33 (2), 37-48.

Fazio, Russell H. (1986), "How Do Attitudes Guide Behavior?," in *The Handbook of Motivation and Cognitive Foundations of Social Behavior,* Richard M. Sorrentino and E. Tory Higgins, eds., New York: Guilford Press, 204-243.

---- (1990), "A Practical Guide to the Use of Response Latency in Social Psychological Research," in *Research Methods in Personality and Social Psychology,* Clyde Hendrick and Margaret S. Clark, eds., Vol. 11, Newbury Park, CA: Sage, 74-95.

---- (1995), "Attitudes as Object-Evaluation Associations: Determinants, Consequences, and Correlates of Attitude Accessibility," in *Attitude Strength: Antecedents and Consequences,* Richard E. Petty and Jon A. Krosnick, eds., Mahwah, NJ: Lawrence Erlbaum Associates, 247-282.

Fazio, Russell H., Jeaw-Mei Chen, Elizabeth C. McDonel, and Steven J. Sherman (1982), "Attitude Accessibility, Attitude-Behavior Consistency, and the Strength of the Object-Evaluation Association," *Journal of Experimental Social Psychology*, 18 (July), 339-357.

Fazio, Russell H., Martha C. Powell, and Paul M. Herr (1983), "Toward a Process Model of the Attitude-Behavior Relation: Accessing One's Attitude Upon Mere Observation of the Attitude Object," *Journal of Personality and Social Psychology*, 44 (4), 723-735.

Fazio, Russell H., Martha C. Powell, and Carol J. Williams (1989), "The Role of Attitude Accessibility in the Attitude-to-Behavior Process," *Journal of Consumer Research*, 16 (December), 280-288.

Fazio, Russell H., David M. Sanbonmatsu, Martha C. Powell, and Frank R. Kardes (1986), "On the Automatic Activation of Attitudes," *Journal of Personality and Social Psychology*, 50 (2), 229-238.

Fazio, Russell H. and Carol J. Williams (1986), "Attitude Accessibility as a Moderator of the Attitude-Perception and Attitude-Behavior Relations: An Investigation of the 1984 Presidential Election," *Journal of Personality and Social Psychology*, 51 (3), 505-514.

Fazio, Russell H. and Mark P. Zanna (1978a), "Attitude Qualities Relating to the Strength of the Attitude-Behavior Relationship," *Journal of Experimental Social Psychology*, 14, 398-408.

---- (1978b), "On the Predictive Validity of Attitudes: The Roles of Direct Experience and Confidence," *Journal of Personality*, 46 (2), 228-243.

---- (1981), "Direct Experience and Attitude-Behavior Consistency," *Advances in Experimental Social Psychology*, 14, 161-202.

Fazio, Russell H., Mark P. Zanna, and Joel Copper (1978), "Direct Experience and Attitude-Behavior Consistency: An Information Processing Analysis," *Personality and Social Psychology Bulletin*, 4 (1), 48-51.

Fishbein, Martin and Icek Ajzen (1975), *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*, Reading, MA: Addison-Wesley.

Gardner, Meryl Paula (1985), "Does Attitude toward the Ad Affect Brand Attitude under a Brand Evaluation Set?," *Journal of Marketing Research*, 22 (May), 192-198.

Gerbing, David W. and James C. Anderson (1988), "Au Updated Paradigm for Scale Development Incorporating Unidimensionality and Its Assessment," *Journal of Marketing*, 25 (May), 186-192.

Gerrig, Richard J. (1994), "Narrative Thought?," *Personality and Social Psychology Bulletin*, 20 (6), 712-715.

Gibson, James J. (1966), *The Senses Considered as Perceptual Systems*, Boston: Houghton Mifflin.

Green, Melanie C. and Timothy Brock (2000), "The Role of Transportation in the Persuasiveness of Public Narratives," *Journal of Personality and Social Psychology*, 79 (5), 701-721.

Greenwald, Anthony G. (1968), "Cognitive Learning, Cognitive Responses to Persuasion, and Attitude Change," in *Psychological Foundations of Attitudes,* Anthony G. Greenwald, Timothy C. Brock, and Thomas M. Ostrom, eds., New York: Academic Press, 147-170.

Grewal, Dhruv, Jerry Gotlieb, and Howard. Marmorstein (1994), "The Moderating Effects of Message Framing and Source Credibility on the Price-Perceived Risk Relationship," *Journal of Consumer Research*, 21 (1), 145-153.

Griffith, David A. and Qimei Chen (2004), "The Influence of Virtual Direct Experience (VDE) on On-Line Ad Message Effectiveness," *Journal of Advertising*, 33 (1), 55-68.

Häubl, Gerald and Valerie Trifts (2000), "Consumer Decision Making in Online Shopping Environments: The Effects of Interactive Decision Aids," *Marketing Science*, 19 (1), 4-21.

Haugtvedt, Curtis P. and Joseph R. Priester (1997), "Conceptual and Methodological Issues in Advertising Effectiveness: An Attitude Strength Perspective," in *Measuring Advertising Effectiveness,* William D. Wells, ed., Mahwah, NJ: Lawrence Erlbaum Associates, 79-93.

Havlena, William J. and Morris B. Holbrook (1986), "The Varieties of Consumption Experience: Comparing Two Typologies of Emotion in Consumer Behavior," *Journal of Consumer Research*, 13 (December), 394-404.

Heeter, Carrie (2000), "Interactivity in the Context of Designed Experience," *Journal of Interactive Advertising*, 1 (1), [http://www.jiad.org].

Hirschmann, Elizabeth and Morris B. Holbrook (1982), "Hedonic Consumption: Emerging Concepts, Methods and Propositions," *Journal of Marketing*, 48 (Summer), 92-101.

Hoffman, Donna L., Thomas P. Novak, and Adam Duhachek (2003), "The Influence of Goal-Directed and Experiential Activities on Online Flow Experience," *Journal of Consumer Psychology*, 13 (1/2), 3-16.

Holbert, R. Lance and Michael T. Stephenson (2002), "Structural Equation Modeling in the Communication Sciences, 1995-2000," *Human Communication Research*, 28 (4), 531-551.

Holbrook, Morris B. and Rajeev Batra (1987), "Assessing the Role of Consumer Responses to Advertising," *Journal of Consumer Research*, 14 (December), 404-419.

Holbrook, Morris B. and Elizabeth C. Hirschmann (1982), "The Experiential Aspects of Consumption: Consumer Fantasies, Feelings, and Fun," *Journal of Consumer Research*, 9 (September), 132-140.

Hoque, Abeer Y. and Gerald L. Lohse (1999), "An Information Search Cost Perspective for Designing Interfaces for Electronic Commerce," *Journal of Marketing*, 36 (August), 387-394.

Houston, David A. and Russell H. Fazio (1989), "Biased Processing as a Function of Attitude Accessibility: Making Objective Judgments Subjectively," *Social Cognition*, 7 (1), 51-66.

Howard, John A. (1989), *Consumer Behavior in Marketing Strategy*, Englewood Cliffs, NJ: Prentice-Hall.

Howard, John A. and J. N. Sheth (1969), *The Theory of Buyer Behavior*, New York: John Wiley.

Hu, Li-tze and Peter M. Bentler (1999), "Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives," *Structural Equation Modeling*, 6 (1), 1-55.

Hunter, John E. and David W. Gerbing (1982), "Unidimensional Measurement, Second Order Factor Analysis, and Causal Models," *Research in Organizational Behavior*, 4, 267-320.

Jacoby, Jacob, Donald E. Speller, and Carol A. Kohn (1974), "Brand Choice Behavior as a Function of Information Overload," *Journal of Marketing Research*, 11 (1), 63-69.

Jewell, Robert D. and H. Rao Unnava (2003), "When Competitive Interference Can Be Beneficial," *Journal of Consumer Research*, 30 (2), 283-291.

Kempf, DeAnna S. (1999), "Attitude Formation from Product Trial: Distinct Roles of Cognition and Affect for Hedonic and Functional Products," *Psychology and Marketing*, 16 (1), 35-50.

Kempf, DeAnna S. and Robert E. Smith (1998), "Consumer Processing of Product Trial and the Influence of Prior Advertising: A Structural Modeling Approach," *Journal of Marketing Research*, 35 (August), 325-338.

Kisielius, Jolita and Brian Sternthal (1984), "Detecting and Explaining Vividness Effects in Attitudinal Judgments," *Journal of Marketing Research*, 21 (February), 54-64.

---- (1986), "Examining the Vividness Controversy: An Availability-Valence Interpretation," *Journal of Consumer Research*, 12 (March), 418-431.

Klein, Lisa R. (2003), "Creating Virtual Product Experiences: The Role of Telepresence," *Journal of Interactive Marketing*, 17 (1), 41-55.

Kline, Rex B. (1998), *Principles and Practice of Structural Equation Modeling*, New York: Guilford Press.

Koriat, Asher, Sarah Lichtenstein, and Baruch Fischoff (1980), "Reasons for Confidence," *Journal of Experimental Psychology: Human Learning and Memory*, 6 (2), 107-118.

Krosnick, Jon A., David S. Boninger, Yao C. Chuang, Matthew K. Berent, and Catherine G. Carnot (1993), "Attitude Strength: One Construct or Many Related Constructs?," *Journal of Personality and Social Psychology*, 65 (6), 1132-1151.

Krosnick, Jon A. and Richard E. Petty (1995), "Attitude Strength: An Overview," in *Attitude Strength: Antecedents and Consequences,* Richard E. Petty and Jon A. Krosnick, eds., Mahwah, NJ: Lawrence Erlbaum Associates, 1-24.

Krosnick, Jon A. and Howard Schuman (1988), "Attitude Intensity, Importance, and Certainty and Susceptibility to Response Effects," *Journal of Personality and Social Psychology*, 54 (6), 940-952.

Krugman, Herbert E. (1965), "The Impact of Television Advertising: Learning without Involvement," *Public Opinion Quarterly*, 29 (3), 349-356.

Lang, Annie (2000), "The Limited Capacity Model of Mediated Message Processing," *Journal of Communication*, 50 (1), 46-67.

Lang, Peter J. (1979), "A Bio-Informational Theory of Emotional Imagery," *Psychophysiology*, 16 (6), 495-512.

Lee, Ki-Young and Hairong Li (2005), "Alternative Measures of the Effectiveness of 3-D Advertising," paper presented at the American Academy of Advertising Conference, (March 31 - April 3), Houston, TX.

Li, Hairong, Terry Daugherty, and Frank Biocca (2001), "Characteristics of Virtual Experience in Electronic Commerce: A Protocol Analysis," *Journal of Interactive Marketing*, 15 (3), 13-30.

Li, Hairong, Terry Daugherty, and Frank Biocca (2002), "Impact of 3-D Advertising on Product Knowledge, Brand Attitude, and Purchase Intention: The Mediating Role of Presence," *Journal of Advertising*, 31 (3), 43-57.

---- (2003), "The Role of Virtual Experience in Consumer Learning," *Journal of Consumer Psychology*, 13 (4), 395-407.

Machleit, Karen A. and R. Dale Wilson (1988), "Emotional Feelings and Attitude toward the Advertisement: The Roles of Brand Familiarity and Repetition," *Journal of Advertising*, 17 (3), 27-35.

MacInnis, Deborah J. and Linda L. Price (1987), "The Role of Imagery in Information Processing: Review and Extensions," *Journal of Consumer Research*, 13 (March), 473-491.

MacInnis, Deborah J. and Bernard J. Jaworski (1989), "Information Processing from Advertisements: Towards an Integrative Framework," *Journal of Marketing*, 53 (October), 1-23.

MacKenzie, Scott B. (2001), "Opportunities for Improving Consumer Research through Latent Variable Structural Equation Modeling," *Journal of Consumer Research*, 28 (June), 159-166.

Mano, Haim and Richard L. Oliver (1993), "Assessing the Dimensionality and Structure of the Consumption Experience: Evaluation, Feeling, and Satisfaction," *Journal of Consumer Research*, 20 (December), 451-466.

Marks, Lawrence J. and Michael A. Kamins (1988), "The Use of Product Sampling and Advertising: Effects of Sequence of Exposure and Degree of Advertising Claim Exaggeration on Consumers' Belief Strength, Belief Confidence, and Attitudes," *Journal of Marketing Research*, 25 (August), 266-281.

Mathwick, Charla and Edward Rigdon (2004), "Play, Flow, and the Online Search Experience," *Journal of Consumer Research*, 31 (September), 324-332.

Meyers-Levy, Joan and Prashant Malaviya (1999), "Consumers' Processing of Persuasive Advertisements: An Integrative Framework of Persuasion Theories," *Journal of Marketing*, 63 (Special Issue), 45-60.

Millar, Murray G. and Karen U. Millar (1996), "The Effects of Direct and Indirect Experience on Affective and Cognitive Responses and the Attitude-Behavior Relation," *Journal of Experimental Social Psychology*, 32, 561-579.

Mitchell, Andrew A. and Jerry C. Olson (1981), "Are Product Attribute Beliefs the Only Mediator of Advertising Effects on Brand Attitude?," *Journal of Marketing Research*, 18 (August), 318-332.

Novak, Thomas P., Donna L. Hoffman, and Yiu-Fai Yung (2000), "Measuring the Customer Experience in Online Environments: A Structural Equation Approach," *Marketing Science*, 19 (1), 22-44.

Nunnally, Jum C. (1978), *Psychometric Theory,* (2nd ed.), New York: McGraw-Hill.

Olson, G. Jerry, Daniel R. Toy, and Philip A. Dover (1982), "Do Cognitive Responses Mediate the Effects of Advertising Content on Cognitive Structure?," *Journal of Consumer Research*, 9 (December), 245-262.

Petty, Richard E. and John T. Cacioppo (1981), "Personal Involvement as a Determinant of Argument-Based Persuasion," *Journal of Personality and Social Psychology*, 41 (5), 847-855.

---- (1986), *Attitudes and Persuasion: Classic and Contemporary Approaches*, Boulder, CO: Westview Press.

Petty, Richard E., John T. Cacioppo, and David Schumann (1983), "Central and Peripheral Routes to Advertising Effectiveness: The Moderating Role of Involvement," *Journal of Consumer Research*, 10 (September), 135-145.

Petty, Richard E., Curtis P. Haugtvedt, and G. A. Rennier (1995), "Elaboration as a Determinant of Attitude Accessibility," Unpublished manuscript, Ohio State University, Columbus [cited in Petty, Haugtvedt, and Smith (1995), "Elaboration as a Determinant of Attitude Strength: Creating Attitudes That Are Persistent, Resistant, and Predictive of Behavior," in *Attitude Strength: Antecedents and Consequences*, Richard E. Petty and Jon A. Krosnick, eds., Mahwah, NJ: Lawrence Erlbaum Associates, 93-130].

Petty, Richard E., Curtis P. Haugtvedt, and Stephen M. Smith (1995), "Elaboration as a Determinant of Attitude Strength: Creating Attitudes That Are Persistent, Resistant, and Predictive of Behavior," in *Attitude Strength: Antecedents and Consequences,* Richard E. Petty and Jon A. Krosnick, eds., Mahwah, NJ: Lawrence Erlbaum Associates, 93-130.

Priester, Joseph R., Dhananjay Nayakankuppam, Monique A. Fleming, and John Godek (2004), "The A^2SC^2 Model: The Influence of Attitudes and Attitude Strength on Consideration and Choice," *Journal of Consumer Research*, 30 (March), 574-587.

Raden, David (1985), "Strength-Related Attitude Dimensions," *Social Psychological Quarterly*, 48 (4), 312-330.

Rao, Akshay R. and Wanda A. Sieben (1992), "The Effect of Prior Knowledge on Price Acceptability and the Type of Information Examined," *Journal of Consumer Research*, 19 (2), 256-270.

Rossiter, John R. and Larry Percy (1980), "Attitude Change through Visual Imagery in Advertising," *Journal of Advertising*, 9 (2), 10-16.

Schlosser, Ann E. (2003), "Experiencing Products in the Virtual World: The Role of Goal and Imagery in Influencing Attitudes versus Purchase Intention," *Journal of Consumer Research*, 30 (September), 184-198.

Schwab, Donald P. (1980), "Construct Validity in Organization Behavior," in *Research in Organizational Behavior,* Barry M. Staw and Larry L. Cumming, eds. Vol. 2, Greenwich, CT: JAI Press, 3-43.

Sheikh, Anees A. and Charles S. Jordan (1983), "Clinical Uses of Mental Imagery," in *Imagery: Current Theory, Research, and Application,* Anees A. Sheikh, ed., New York: John Wiley & Sons, 391-435.

Sharma, S. (2000), "Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy," *Academy of Management Journal*, 43 (4), 681-697.

Shavitt, Sharon and Timothy C. Brock (1986), "Self-Relevant Responses in Commercial Persuasion: Field and Experimental Tests," in *Advertising and Consumer Psychology,* Keith Sentis and Jerry Olson, eds., Vol. 3, New York: Praeger, 149-171.

Sheehan, Peter W. (1967), "A Shortened Form of Betts's Questionnaire Upon Mental Imagery," *Journal of Clinical Psychology*, 23, 386-389.

Smith, Robert E. and William R. Swinyard (1982), "Information Response Models: An Integrated Approach," *Journal of Marketing*, 46 (Winter), 81-93.

---- (1983), "Attitude-Behavior Consistency: The Impact of Product Trial versus Advertising," *Journal of Marketing Research*, 20 (August), 257-267.

---- (1988), "Cognitive Response to Advertising and Trial: Belief Strength, Belief Confidence and Product Curiosity," *Journal of Advertising*, 17 (3), 3-14.

Steuer, Jonathan (1992), "Defining Virtual Reality: Dimensions Determining Telepresence," *Journal of Communication*, 42 (4), 73-93.

Strack, Fritz (1992), "The Different Routes to Social Judgments: Experiential versus Informational Strategies," in *The Construction of Social Judgments,* Leonard L. Martin and Abraham Tesser, eds., Hillsdale, NJ: Lawrence Erlbaum Associates, 249-276.

Sundar, S. Shyam and Jinhee Kim (2005), "Interactivity and Persuasion: Influencing Attitudes with Information and Involvement," *Journal of Interactive Advertising*, 5 (2), [http://www.jiad.org].

Taylor, Shelley E. and Sherry Schneider, K. (1989), "Coping and the Simulation of Events," *Social Cognition*, 7 (2), 174-194.

Tremayne, Mark and Sharon Dunwoody (2001), "Interactivity, Information Processing, and Learning on the World Wide Web," *Science Communication*, 23 (2), 111-134.

White, J. Dennis, Armen Tashchian, and Roobina Ohanian (1991), "An Exploration into the Scaling of Consumer Confidence: Dimensions, Antecedents, and Consequences," *Journal of Social Behavior and Personality*, 6 (3), 509-528.

Wicker, Allan W. (1969), "Attitudes versus Actions: The Relationship of Verbal and Overt Behavior Response to Attitude Objects," *Journal of Social Issues*, 25 (4), 41-78.

Wright, Alice A. and John G. Lynch, Jr. (1995), "Communication Effects of Advertising versus Direct Experience When Both Search and Experience Attributes Are Present," *Journal of Consumer Research*, 21 (March), 708-718.

Wright, Peter (1973), "The Cognitive Processes Mediating Acceptance of Advertising," *Journal of Marketing Research*, 10 (February), 53-62.

---- (1980), "Message-Evoked Thoughts: Persuasion Research Using Thought Verbalizations," *Journal of Consumer Research*, 7 (September), 151-175.

Wu, Chenghuan and David R. Shaffer (1987), "Susceptibility to Persuasive Appeals as a Function of Source Credibility and Prior Experience with the Attitude Object," *Journal of Personality and Social Psychology*, 52 (4), 677-688.

Yi, Huiuk, Joseph E. Phelps, and David Roskos-Ewoldsen (1998), "Examining the Effectiveness of Comparative Advertising: The Role of Attitude Accessibility," *Journal of Current Issues and Research in Advertising*, 20 (1), 61-74.

Zajonc, Robert B. (1968), "Attitudinal Effects of Mere Exposure," *Journal of Personality and Social Psychology*, 9 (2), 1-27.

Zanna, Mark P. and Russell H. Fazio (1982), "The Attitude Behavior Relation: Moving toward a Third Generation of Research," in *Consistency in Social Behavior: The Ontario Symposium,* Mark P. Zanna, E. Tory Higgins, and C. Peter Herman, eds. Vol. 2, Hillsdale, NJ: Lawrence Erlbaum Associates, 283-301.

APPENDIX 1

QUESTIONNAIRE FOR MAIN EXPERIMENT

SHORT SURVEY

The purpose of this questionnaire is to record your background and experience with **digital cameras and laptop computers** in general and **Kodak** digital camera and **IBM** laptop computer in particular.

1. Demographic information

Gender female_____ male _____	How old are you? _____ years old

2. **Computer use.**

On average how many hours a week do you spend in using the Internet? _____ hours

3. Please indicate your experience with a **digital camera** and a **laptop computer** in general by circling the most appropriate number.

How often do you use a digital camera? Never 1 2 3 4 5 6 7 8 9 Everyday Do you currently own a digital camera? Yes_____ No_____ Overall, how much time have you spent searching for digital camera? Very little 1 2 3 4 5 6 7 8 9 Very much	How often do you use a laptop computer? Never 1 2 3 4 5 6 7 8 9 Everyday Do you currently own a laptop computer? Yes_____ No_____ Overall, how much time have you spent searching for laptop computer? Very little 1 2 3 4 5 6 7 8 9 Very much

4. Please indicate your familiarity with **Kodak digital camera** and **IBM laptop computer** by circling the most appropriate number.

Kodak digital camera	IBM laptop computer
Unfamiliar 1 2 3 4 5 6 7 Familiar Inexperienced 1 2 3 4 5 6 7 Experienced Not knowledgeable 1 2 3 4 5 6 7 knowledgeable	Unfamiliar 1 2 3 4 5 6 7 Familiar Inexperienced 1 2 3 4 5 6 7 Experienced Not knowledgeable 1 2 3 4 5 6 7 knowledgeable

Instructions

The aim of this survey is to determine the vividness of your mental imagery. The items of the survey will bring certain images to your mind. You are to rate the vividness of each image by reference to the accompanying rating scale, which is shown below. Before you turn to the items on the next page, familiarize yourself with the different rating scale. A copy of the rating scale is printed on the next page for your reference. Try to do each item separately independent of how you may have done other items.

Rating Scale

The image aroused by an item of this survey may be:

No image present at all, you only 'knowing' that you are thinking of the object	Rating 1
So vague and dim as to be hardly discernible	Rating 2
Vague and dim	Rating 3
Not clear or vivid, but recognizable	Rating 4
Moderately clear and vivid	Rating 5
Very clear and comparable in vividness to the actual experience	Rating 6
Perfectly clear and as vivid as the actual experience	Rating 7

Example

An example of an item on the survey would be one that asks you to consider an image that comes to your mind's eye of a **red apple**. If your visual image is moderately clear and vivid you would check the rating scale and mark '5' in the brackets as follows:

Item	Rating
A red apple	(5)

Now turn to the next page when you have understood these instructions.

Think of some relative or friend whom you frequently see, considering carefully the picture that rises before your mind's eye. Classify the images suggested by each of the following questions as indicated by the degree of clearness and vividness specified on the rating scale.

Item	Rating
1. The exact contour of face, head, shoulders and body	( )
2. Characteristic poses of head, attitudes of body, etc.	( )
3. The precise carriage, length of step, etc. in walking.	( )
4. The different colors worn in some familiar costume	( )

Think of seeing the following, considering carefully the picture that comes before your mind's eye; and classify the image of clearness and vividness specified on the Rating Scale.

5. The sun as it is sinking below the horizon.	( )

Rating Scale

The image aroused by an item of this survey may be:

No image present at all, you only 'knowing' that you are thinking of the object	Rating 1
So vague and dim as to be hardly discernible	Rating 2
Vague and dim	Rating 3
Not clear or vivid, but recognizable	Rating 4
Moderately clear and vivid	Rating 5
Very clear and comparable in vividness to the actual experience	Rating 6
Perfectly clear and as vivid as the actual experience	Rating 7

MAIN SURVEY

The purpose of this questionnaire is to record **your evaluation of the product web site you just saw, your experience with the site, and the evaluation of the product in the site.** Completion of the survey will take approximately 10 minutes. Your responses will remain anonymous. Thank you for your assistance!

---

1. **Utilitarian** products refer to goods whose goal of consumption is mainly practical, functional, something that helps achieve a goal (e.g., pain killer), while **hedonic** products refer to goods whose goal of consumption is mainly for fun and pleasure, something that is enjoyable and appeals to the sense (e.g., perfume). Please try to categorize the product you just saw as utilitarian, hedonic, or both by placing a check (V).

   Utilitarian _____ Hedonic _____ Both _____

2. Please indicate your level of agreement with the following statements by circling the most appropriate number.

The web site I just saw....	Strongly Disagree						Strongly Agree
Included various interactive features.	1	2	3	4	5	6	7
Included vivid product description.	1	2	3	4	5	6	7
Included a lot of information about the product.	1	2	3	4	5	6	7
Was well organized.	1	2	3	4	5	6	7

3. How would you describe **the images that occurred in your mind** while examining the web site materials? Indicate your level of agreement or disagreement with the following statements by circling the most appropriate number.

The images were....	Strongly Disagree						Strongly Agree
Clear	1	2	3	4	5	6	7
Vivid	1	2	3	4	5	6	7
Intense	1	2	3	4	5	6	7
Lifelike	1	2	3	4	5	6	7
Sharp	1	2	3	4	5	6	7

4. The following items concern your evaluation about product-related information obtained during exposure to the web site. Product-related information includes **any ideas, thoughts, and images about the product you have had while examining the web site, in addition to the product information directly obtained from the web site.** Please indicate your evaluation by circling the most appropriate number.

In judging the quality and performance of the product presented, overall, how helpful would you rate the product-related information you obtained during exposure to the web site?

Not helpful at all	1	2	3	4	5	6	7	Extremely helpful

In understanding different features of the product presented, overall, how helpful would you rate the product-related information you obtained during exposure to the web site?

Not helpful at all	1	2	3	4	5	6	7	Extremely helpful

To what extent did the product-related information you obtained during exposure to the web site enable you to accurately evaluate the product presented?

It did not enable me to evaluate the product at all	1	2	3	4	5	6	7	It fully enabled me to evaluate the product

5. For each of the items below, circle the number that best describes how you felt while you were viewing the web site.

Happy	1	2	3	4	5	6	7	Unhappy
Pleased	1	2	3	4	5	6	7	Annoyed
Excited	1	2	3	4	5	6	7	Calm
Stimulated	1	2	3	4	5	6	7	Relaxed
Aroused	1	2	3	4	5	6	7	Unaroused

6. For each of the items below, circle the number that best describes your overall feelings about the product you saw in the web site.

Bad	1	2	3	4	5	6	7	Good
Dislike quite a lot	1	2	3	4	5	6	7	Like quite a lot
Unpleasant	1	2	3	4	5	6	7	Pleasant
Bad quality	1	2	3	4	5	6	7	Good quality

7. How certain are you of the accuracy of the responses you gave in the previous questions regarding your feelings toward the product?

Not confident	1	2	3	4	5	6	7	Confident
Not sure	1	2	3	4	5	6	7	Sure
Uncertain	1	2	3	4	5	6	7	Certain

8. How likely would you purchase this product? Circle the number that best indicates the likelihood, assuming that the price was within your acceptable range.

Unlikely	1	2	3	4	5	6	7	Likely
Improbably	1	2	3	4	5	6	7	Probably
Impossible	1	2	3	4	5	6	7	Possible

THOUGHT LISTING

Please read the instructions below carefully.

Instructions

As you viewed the web site, what were the thoughts that went through your mind? Please write down in the lines below, everything that you thought of, **regardless of whether it pertained to the product itself or anything else** that went through your mind. Please write one item per line; you do not need to fill all lines, but please do your best to remember as many as possible. Do not worry about spelling, grammar, or punctuation.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____

APPENDIX 2

INSTRUCTION FOR EXPERIMENT

1st screen for 2-D condition

Welcome !

The purpose of this study is to collect your evaluation of two products presented on web sites.

You will be asked to view two products' web sites one at a time. **Upon completion of each web site viewing, you will be asked to report your opinions and thoughts.**

So you should thoroughly examine the web site to determine how you think and feel about the product presented.

Prior to the actual experiment, you will be given a training session to familiarize yourself with web site viewing.

When you are ready, click CONTINUE button to proceed to the training session.

CONTINUE

1st screen for 3-D condition

Welcome !

The purpose of this study is to collect your evaluation of two products presented on web sites.

You will be asked to view two products' web sites using 3D features one at a time. **Upon completion of each web site viewing, you will be asked to report your opinions and thoughts.**

So you should thoroughly examine the web site to determine how you think and feel about the product presented.

Prior to the actual experiment, you will be given a training session to familiarize yourself with 3D interface.

When you are ready, click CONTINUE button to proceed to the training session.

CONTINUE

APPENDIX 3

INSTRUCTION FOR REACTION TIME MEASURE

1st screen

PLEASE DO NOT CLICK CONTINUE UNTIL TOLD DO SO

Instructions for Reaction Time

Now we are about to test a new attitude measurement technique using a computer program. A series of brand names from various product categories (e.g., clothing, laptop computer, wrist watch, digital camera) will appear on the computer screen and you need to indicate your overall feelings about the brand by hitting one of the two keys of your computer keyboard - **"z" for "like" and "/" for "dislike."**

There are two things that we want you to keep in mind as you do this task. First, and above all, be accurate. Don't be in such a hurry to respond that you regret your decision. Second, while being accurate, try to respond as quickly as possible.

Presentations of brand names will be separated by a two-second interval. The computer will record your response and reaction time to each trial. Prior to actual test, you will be given a training session.

Do not click CONTINUE until told do so. Please raise your hand when you have finished reading these instructions.

ID: CONTINUE

2nd screen

Training Session

This is a training session for reaction time measure. When you click CONTINUE, ten brand names from various product categories will appear on your computer screen, and you need to indicate your overall feelings about the product by hitting **"z"** of your keyboard for **"like"** or **"/"** of your keyboard for **"dislike."** To avoid mistakenly hitting a wrong key, keep one index finger above each of the two keys during the test. Please respond as quickly and accurately as possible.

Click **CONTINUE** when you are ready.

CONTINUE

3rd to 22nd screens

The test is about to begin.
Place your index fingers on "z" and "/" keys of your keyboard now.

(*The above instructions were displayed for two seconds between presentations of ten brand names*)

23th screen

This is the end of a training session. If you don't feel comfortable with the procedure, click **GO BACK TO TRAINING**. It will bring you back to the training session. Otherwise, click **CONTINUE** to take an actual experiment.

GO BACK TO TRAINING | CONTINUE

24th screen

Now we are about to actually record your evaluations about products and reaction time. This time, twenty brand names, different from the training session, will appear on your computer screen. The procedures used in this session are exactly alike to those in the training session. You need to indicate your overall feelings about the product by hitting either **"z"** for **like** or **"/"** for **dislike**. To avoid mistakenly hitting a wrong key, keep one index finger above each of the two keys during the test. Please respond as quickly and accurately as possible.

Click **CONTINUE** when you are ready.

CONTINUE

25th to 64th screens

The test is about to begin.
Place your index fingers on "z" and "/" keys of your keyboard now.

(*The above instructions were displayed for two seconds between presentations of twenty brand names*)

Last page of reaction time measure screen

This is the end of the experiment. Thank you very much for your cooperation. In case you have any questions about this experiment, feel free to let the researchers know.

APPENDIX 4

DESCRIPTIVE STATISTICS FOR MEASUREMENT ITEMS

Table 21. Descriptive Statistics for Measurement Items (IBM laptop computer)

	N	Minimu	Maximu	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
LMI1	226	2.00	7.00	4.9779	1.17168	-.224	.162	-.335	.322
LMI2	226	1.00	7.00	4.6858	1.25201	-.196	.162	-.328	.322
LMI3	226	1.00	7.00	3.8274	1.45185	.067	.162	-.345	.322
LMI4	226	1.00	7.00	4.5841	1.38709	-.392	.162	-.008	.322
LMI5	226	1.00	7.00	4.6549	1.38416	-.427	.162	.007	.322
LER1	226	3.00	7.00	4.2566	.78631	.785	.162	.956	.322
LER2	226	3.00	7.00	4.3673	.88070	.745	.162	.608	.322
LER3	226	1.00	6.00	2.9912	1.15467	.524	.162	-.189	.322
LER4	226	1.00	7.00	3.4912	1.17091	.306	.162	-.593	.322
LDIAG1	226	1.00	7.00	4.9690	1.09297	-.618	.162	.239	.322
LDIAG2	226	2.00	7.00	5.0708	1.10929	-.555	.162	.123	.322
LDIAG3	226	2.00	7.00	4.7124	1.05894	-.400	.162	-.258	.322
LAC1	226	3.00	7.00	5.7080	.97690	-.511	.162	-.102	.322
LAC2	226	3.00	7.00	5.7080	.97234	-.615	.162	.260	.322
LAC3	226	3.00	7.00	5.5796	1.01777	-.461	.162	-.264	.322
AI1	226	1.00	7.00	5.2124	1.18473	-.532	.162	.212	.322
AI2	226	1.00	7.00	4.9690	1.25217	-.160	.162	-.266	.322
AI3	226	1.00	8.00	4.3053	1.30628	.251	.162	.232	.322
AI4	226	1.00	7.00	4.8407	1.47312	-.319	.162	-.483	.322
AI5	226	1.00	7.00	5.5398	1.18536	-.483	.162	-.169	.322
LPCE1	226	1.00	9.00	5.6460	3.28477	-.147	.162	-1.714	.322
LPCE3	226	1.00	9.00	3.7080	2.56535	.604	.162	-.908	.322
LBF1	226	1.00	7.00	3.3186	1.92188	.456	.162	-.896	.322
LBF2	226	1.00	7.00	3.0265	1.79114	.662	.162	-.431	.322
LBF3	226	1.00	7.00	3.1062	1.82264	.566	.162	-.677	.322
LTL	226	.00	14.00	4.6947	2.42573	.474	.162	1.060	.322
LRT	226	.371	1.892	.8788	.276363	1.133	.162	1.634	.322

Note: LMI (Mental Imagery for IBM laptop); LER (Emotional Response for IBM laptop); LDIAG (Information Diagnosticity for IBM laptop); LAC (Attitude Confidence for IBM laptop); AI (Ability to Imagine – common items for both products); LPCE (Product Category Experience for IBM laptop); LBF (Brand Familiarity for IBM laptop); LTL (Thought Listing for IBM laptop); LRT (Reaction Time for IBM laptop)

Table 22. Descriptive Statistics for Measurement Items (Kodak digital camera)

	N	Minimu	Maximu	Mean	Std.	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
CMI1	227	1.00	7.00	5.3524	1.13240	-.708	.162	.484	.322
CMI2	227	1.00	7.00	5.1189	1.26524	-.795	.162	.644	.322
CMI3	227	1.00	7.00	4.1718	1.39262	-.162	.162	-.500	.322
CMI4	227	1.00	7.00	5.0661	1.42979	-.630	.162	-.161	.322
CMI5	227	1.00	7.00	5.1278	1.34246	-.634	.162	.075	.322
CER1	227	3.00	7.00	5.1101	.99611	.211	.162	-1.166	.322
CER2	227	4.00	7.00	5.1938	1.05903	.214	.162	-1.291	.322
CER3	227	1.00	7.00	4.0044	1.26735	-.048	.162	-.604	.322
CER4	227	1.00	7.00	4.3304	1.34068	-.055	.162	-.478	.322
CDIAG1	227	2.00	7.00	5.2379	.99368	-.629	.162	.274	.322
CDIAG2	227	2.00	7.00	5.1806	1.10828	-.599	.162	.075	.322
CDIAG3	227	2.00	7.00	5.0969	.92619	-.329	.162	.169	.322
CAC1	227	3.00	7.00	5.8811	.89687	-.469	.162	.004	.322
CAC2	227	2.00	7.00	5.8238	.97070	-.635	.162	.483	.322
CAC3	227	1.00	7.00	5.7665	1.00579	-.781	.162	1.432	.322
AI1	227	1.00	7.00	5.2070	1.17735	-.541	.162	.246	.322
AI2	227	1.00	7.00	4.9604	1.25268	-.143	.162	-.284	.322
AI3	227	1.00	8.00	4.3172	1.30547	.237	.162	.225	.322
AI4	227	1.00	7.00	4.8502	1.46781	-.348	.162	-.465	.322
AI5	227	1.00	7.00	5.5419	1.18686	-.477	.162	-.183	.322
CPCE1	227	.00	9.00	4.5419	1.95339	.071	.162	-.716	.322
CPCE3	227	1.00	9.00	3.8018	2.03952	.458	.162	-.459	.322
CBF1	227	1.00	7.00	3.6123	2.00650	.099	.162	-1.220	.322
CBF2	227	1.00	7.00	3.0132	1.76365	.497	.162	-.719	.322
CBF3	227	1.00	7.00	3.1013	1.79067	.462	.162	-.819	.322
CTL	227	.00	14.00	4.6564	2.78682	.839	.162	1.146	.322
CRT	227	.387	1.833	.80904	.224566	1.260	.162	2.516	.322

Note: CMI (Mental Imagery for Kodak digital camera); CER (Emotional Response for Kodak digital camera); CDIAG (Information Diagnosticity for Kodak digital camera); CAC (Attitude Confidence for Kodak digital camera); AI (Ability to Imagine – common items for both products); CPCE (Product Category Experience for Kodak digital camera); CBF (Brand Familiarity for Kodak digital camera); CTL (Thought Listing for Kodak digital camera); CRT (Reaction Time for Kodak digital camera)