POSITIONING PRODUCTS IN BUSINESS-TO-CONSUMER ELECTRONIC COMMERCE: DIFFERENTIAL EFFECTS OF PRODUCT POSITIONING ON AFFECT AND COGNITION

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POSITIONING PRODUCTS IN BUSINESS-TO-CONSUMER ELECTRONIC COMMERCE: DIFFERENTIAL EFFECTS OF PRODUCT POSITIONING ON AFFECT AND COGNITION

Abstract

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Continuous progress in the capabilities of Internet technologies has enabled the creation of Virtual Product Experiences (VPEs) in business-to-consumer electronic commerce. While issues surrounding VPEs have gained some attention in information systems research, studies of VPEs are still few and far between. However, it has been demonstrated that the concept of presence is an important determinant of consumer reactions to VPEs. Presence is defined as the experience of virtual objects as actual physical objects.

While researchers have studied the primary antecedents and cognitive reactions to presence, affective reactions have not been addressed. Further, the positioning of the product in electronic commerce as important factor influencing these cognitive and affective reactions has thus far not been considered.

The current research builds on literature from information systems, marketing, and psychology to hypothesize effects of presence on affective and cognitive reactions, as well as the role of product positioning. A laboratory experiment was conducted, followed by a field experiment to test the hypothesized relationships in different contexts. The results of this research demonstrate the importance of affective reactions, in addition to cognitive reactions, to presence. The research also shows an influence of product positioning on affective and cognitive reactions in complex ways.

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1. Introduction

Over the past decade, retail e-commerce has seen a tremendous increase; the relative growth of online U.S. retail sales by far outpaced the growth of total U.S. retail sales, with an increase in e-commerce sales of 23.5% between the years 2005 and 2006, as compared to an increase of only 5.8% in total retail sales. However, online retail sales are still minuscule compared to total retail sales, accounting for only 3.3 percent of total sales in the first quarter of 2007. Whereas total U.S. retail sales during that time period reached over $999.5 billion, U.S. retail e-commerce sales (adjusted for seasonal variation) were only $31.5 billion (U.S. Census Bureau News, 2007a; 2007b).

Contributing to the tremendous growth of online retail sales are factors such as the decrease in cost for Internet access, especially after the burst of the dot-com bubble (Friedman, 2005), but also the growing use of a variety of technologies to influence online consumers' buying behavior. In addition to providing product information and selling products, online retailers use their web sites to signal unobservable qualities (Kirmani & Rao, 2000). However, unlike traditional retailers, online merchants often face the problem of not being able to represent certain product attributes (Lal & Sarvary, 1999); consequently, due to the mediated environment, online consumers lack the ability to directly experience a product. In most cases, online retailers are not able to present their products as they would in a retail store environment, primarily if the dominant product attributes are non-digital (Lal & Sarvary, 1999), i.e., cannot be represented via a computer interface. With the increasing sophistication of technologies such as Macromedia Flash® or Holomatix Blaze 3d®, online retailers can now provide

consumers with *Virtual Product Experiences* (VPEs, Jiang & Benbasat, 2004-2005) to enable virtual interaction with a product prior to purchase (Klein, 1998). Although research has demonstrated that indirect product experiences are less powerful than direct experiences (Fazio & Zanna, 1981), VPEs can mimic some aspects of direct experiences and can thus influence a consumer's attitudes and intentions.

The conditions under which such VPEs are most effective have only partially be determined. For example, researchers have attempted to unearth the effects of VPEs on knowledge, attitudes, and intentions (e.g., Jiang & Benbasat, 2003; 2004-2005; Li, Daugherty, & Biocca, 2002), have identified potential moderators such as motivation (Chung & Zhao, 2004) or tasks (Schlosser, 2003), or have refined prior classifications of products suitable for VPEs (Suh & Lee, 2005). While much of the research has examined the effects of interactivity on attitudes or intentions, Li, Daugherti, and Biocca (2002) have demonstrated a mediating effect of presence. Presence has been defined as a "psychological state in which virtual physical objects are experienced as actual physical objects in sensory or nonsensory ways" (Lee, 2004, p. 44).

Overall, prior research has demonstrated the beneficial effects of VPEs, mostly in regards to cognitive reactions. However, what has been thus far neglected is the effect of presence on consumer's affective reactions.

Further, the product's hedonic or utilitarian (functional) nature has yet to receive wider attention; while hedonic products are primarily consumed for their own sake, utilitarian products are consumed for the function they perform (Woods, 1960). In other words, hedonic goods are generally associated with excitement, fun, and pleasure,

whereas utilitarian goods are consumed for instrumental purposes (e.g., Dhar & Wertenbroch, 2000; Hirschman & Holbrook, 1982; Strahilevitz & Myers, 1998). Prior research has only used a narrow set of different products to test the theories proposed; products used include Sports Watches (Jiang & Benbasat, 2004-2005), PDAs (Jiang & Benbasat, 2003), Digital Cameras (Nicholson, 2005; Schlosser, 2003; 2006), or computers and computer desks (Suh & Chang, 2006; Suh & Lee, 2005), all of which can be considered highly utilitarian in nature. Differential effects of product type (in terms of the hedonic/utilitarian nature) can thus present an important boundary condition of prior findings, which can have important implications, especially as marketers can charge a price premium for hedonic products (Dhar & Wertenbroch, 2000).

The proposed dissertation will thus attempt to answer the following two overarching research questions:

RQ1: What are the effects of technology characteristics on a consumer's sense of presence, affective reactions, cognitive reactions, attitudes, and intentions?

RQ2: What are the differential effects of product positioning on affective and cognitive reactions?

In the following section, the theoretical and practical relevance of the study will be discussed.

1.1. Justification

1.1.1. Theoretical Importance

Although virtual reality and the concept of presence have been studied since over a decade, this topic is still not well understood. In fact, some researchers, based on the limited understanding of presence, question the usefulness of this construct (Schuemie, Van der Straaten, & Van der Mast, 2001). More recently, Grigorovici (2003) demonstrated the potential usefulness of immersive virtual environments and the effects of presence and attitudes.

From a theoretical standpoint, the proposed study will help to inform the understanding of user reactions to virtual environments as technological capabilities (such as bandwidth) increase. Further, as mentioned by IJsselsteijn and Riva (2003), a better understanding of the determinants and outcomes of presence will help to obtain a deeper knowledge of "the basic function of mediation" (p. 10). So far, researchers have begun to explore factors contributing to a heightened sense of presence, and have focused on factors related to the users and the interaction between the medium and the user. Examining the outcomes of presence, research has primarily focused on cognitive reactions, whereas studies including affective reactions are few and far between. This dissertation will help to shed light on the effects of presence on cognitive and affective reactions; further, this dissertation will examine the differential effects of product positioning on presence.

1.1.2. Practical Importance

From a practical standpoint, this dissertation has several important implications, as it helps designers of virtual environments determine how to present products in an online environment to attain the desired outcomes. Thus, based on the intended effects, designers can better choose when to employ certain technologies aimed at increasing presence. As mentioned by Heeter (1992), a better understanding of presence can help designers to choose more deliberately when or when not to use features enhancing presence, especially, as in many cases, there is still a considerable cost to adding new features when designing virtual product representations. Identifying factors that contribute to a heightened sense of presence, and identifying the products for which presence is most important when attempting to maximize positive consumer reactions, is especially important in situations where users interact with a virtual environment using desktop computers, as it is believed that, in contrast to other virtual reality technologies, such desktop virtual reality environments are generally considered inferior in enabling presence (Reid, 2004). This dissertation will help in deciding when to modify the interface to influence consumers' presence.

In addition to examining the outcomes of presence, this dissertation examines the effects of product positioning on consumers' cognitive and affective reactions. From a marketing standpoint, the results of this dissertation will help marketers choose which product features to emphasize when attempting to influence consumers' attitudes. In an online context, designers of VPEs have much control over the way a consumer interacts with a product (as opposed to direct experience) and can thus design the interfaces in

order to maximize the positive effects on attitudes and intentions. Thus, knowing about different impacts on affective and cognitive reactions based on product type has important implications for marketers and designers of VPEs alike.

1.2. Structure of the Dissertation

This chapter provided a general introduction to the topic of Virtual Product Experiences. Further, this chapter highlighted the importance of the topic and presented the research questions. The remaining chapters will be structured as follows.

Chapter 2, Literature Review. This chapter provides a detailed literature review and synthesizes prior theory and findings related to presence in virtual environments. Specifically, Chapter 2 focuses on the nature of direct, indirect, and virtual experiences, followed by a discussion of presence, its antecedents, and outcomes. Finally, Chapter 2 provides a review of hedonic and utilitarian products.

Chapter 3, Theoretical model and propositions. This chapter provides a detailed discussion of the conceptual model. Chapter 3 also presents a set of propositions guiding the hypothesis development.

Chapter 4, Research model, presents a set of testable hypotheses that guide the studies conducted.

Chapter 5, Research methodology. This chapter provides a description of the research methods, followed by a description of the data analysis strategy.

Chapter 6, Study 1, provides an overview of the first experiment conducted. In addition to presenting the study's design and procedures, Chapter 6 highlights the measures used, and the results.

Chapter 7, Study 2, will present the second study conducted. This chapter discusses the study's design, as well as the results.

Chapter 8, General Discussion, Limitations, and Conclusions, discusses the findings on a general level. Further, this chapter discusses the limitations of the dissertation, and provides directions for future research.

2. Literature Review

This chapter reviews relevant prior literature related to Virtual Product Experiences (VPE). This review will provide the foundation for the theoretical model and the hypothesized relationships between the key constructs. The first section will provide an overview of virtual reality, followed by a discussion of human experiences. The third section will discuss a model of presence, followed by a review of factors influencing presence in sections four and five. Section six will discuss the role of the content, and its influences on presence, affective, and cognitive reactions. The penultimate section will provide a discussion of differential roles of affect and cognition, and the effects on consumer's attitudes and intentions. The chapter will conclude with a discussion of hedonic and utilitarian dimensions of attitude.

2.1. Virtual Reality

Although the term "Virtual Reality" did not emerge until the 1980s, attempts to create virtual realities can be traced back to the early 1960s, with the Sensorama as a notable example (Walsh & Pawlowski, 2002). This non-interactive 3D image, enhanced with sound, motion, and even smell was succeeded by the first head-mounted displays and other devices (Walsh & Pawlowski, 2002). Since then, many terms including virtual environments, virtual worlds, artificial reality, or virtual space have been used to refer to the same, basic concept (Biocca &Levy, 1995).

While early VR technology focused on creating immersive virtual environments, a variety of companies has started to realize the value of non-immersive virtual reality

technologies for the purposes of visualization, electronic commerce, education, or entertainment (see Walsh & Pawlowski, 2002). For example, desktop VR technologies are used for architectural models (e.g., using Alias Maya), movies and entertainment, the virtual presentation of products (e.g., as used by companies such as H&M, L'Oréal, T-Mobile, Best Buy, or Canon), training of pilots, or social activities (such as in Second Life, Entropia Universe, or PlayStation Home).

Although Virtual Reality technology is widely used and researched, scholars have yet to agree on a unified definition. Coined by Jaron Lanier, CEO of a manufacturer of VR products, VR is often presented as a medium (Krueger, 1991). Similarly, other researchers equate VR and VR technology; for example, Suh and Lee characterize VR as a "technology that provides users with realistic, interactive computer environments" . However, a technological, rather than experiential focus has been criticized earlier, partly on the grounds that it does not "provide any insight into the processes or effects of using these systems" (Steuer, 1992, p. 73). Consequently, Steuer has attempted to define virtual reality as a type of experience, namely, as "a real or simulated environment in which a perceiver experiences telepresence". This definition allows virtual reality to be applied to a variety of technologies, be they past, present, or future technologies. This is contrasted with VR technology as "the sum of the hardware and software systems that seek to perfect an all-inclusive, immersive, sensory illusion of being present in another environment, another reality; a virtual reality" (Biocca & Delaney, 1995, p. 63).

Regardless of whether the term VR relates to the technology or to a type of experience, or whether one uses immersive or desktop VR technology, the ultimate goal

is the creation of an experience mimicking a human's direct experience (Biocca & Levy, 1995). The following section will discuss different forms of human experience, namely direct experiences, indirect experiences, and virtual experiences (Klein, 2003).

2.2.Direct, Indirect, and Virtual Experiences

Researchers in social psychology (e.g., Fazio & Zanna, 1978) and marketing (e.g., Smith & Swinyard, 1988) have distinguished between attitude formation from direct and indirect experience. While direct experience involves the "direct behavioral interaction with the attitude object" (Fazio & Zanna, 1978, p. 230), indirect experience is based on a description or an advertisement. Fazio and Zanna argued that two attitudes that were formed on the basis of direct and indirect experiences could be similar in favorability, but would, due to the way they were formed, have differential effects on subsequent behavior.

An experience is generally regarded not as a passive reception of stimuli, but rather as an ongoing transaction with an object (Mathur, 1971). Different types of experiences, then, can be differentiated by the quality of the interaction and the number of sensory channels involved (Li, Daugherty, & Biocca, 2001). Thus, direct and indirect experiences can be regarded as two ends of a continuum, on one end of which is direct experience as an unmediated interaction with an object, with a wide range of cues, including visual, auditory, or haptic cues (Gibson, 1966). On the other end of the continuum, indirect experience is mediated in some form, and involves only few sensory channels, and offers limited (or no) interaction. In a consumer behavior context, direct experiences are seen as superior to indirect experiences for three primary reasons (Li et al., 2001). First, consumers tend to trust a self-generated experience. Second, a consumer

can maximize the informational input by being able to control the focus and pace during direct interaction with an object. Finally, direct interactions can produce more affective reactions (as also suggested by Millar & Millar, 1996), as the consumer can better picture the actual consumption experiences.

Over the years, the distinction between direct and indirect experiences has found empirical support in different areas, primarily marketing and social psychology. In 1978, Fazio and Zanna found that attitudes formed from direct experience were more confidently held than attitudes formed from indirect experience and displayed stronger attitude-behavior consistency. Similarly, Smith and Swinyard (1988) demonstrated that consumers who evaluate products through trial have stronger and more confidently held beliefs than consumers who were presented only with an advertisement about a product. Further, Kempf and Smith (1998) demonstrated that perceived diagnosticity and pleasure elicited from product trial significantly affect a consumer's attitude towards a product. Examining differential effects of product types, Wright and Lynch (1995) demonstrated that attributes that need to be experienced directly to be evaluated benefit most from direct experience.

The results of the effects of direct experience can be explained by a number of arguments. Hoch (2002) argued that, being more vivid and intentional, direct experience is more engaging than indirect experience. Second, direct experience is regarded as nonpartisan, as the "source can[not] self-servingly manipulate both the content and manner in which information is presented" (p. 450), and there is "no obvious staging by a self-interested outside party" (p. 450). Third, experience is regarded as more diagnostic,

as the consumer has interpretive flexibility to determine what best serves his or her needs. Finally, Hoch argues that experience is endogenous, allowing the consumer to adapt own tastes to chosen products.

Similar to advertising, a virtual experience can be regarded as a form of mediated experience (Li et al., 2001), and should thus be inferior to direct experience. However, depending on the interactivity and vividness, a virtual experience can be considered closer to a direct experience. Li et al. argue that such virtual product representations can be regarded as "simulations of the consumption experience" (p. 14) by providing virtual affordances, such as the ability to interact with a product in different ways.

In sum, direct experience can be regarded as superior to indirect experience due to the experience being more believable, having a stronger effect on attitudes and intentions, and its greater attitude-behavior consistency. The following section will present a model of presence, a dominant construct in the understanding of virtual experiences. In particular, the following section will present a presence framework, an explication of the construct and its dimensions, followed by a discussion of its primary antecedents and consequences.

2.3. Presence

In the virtual reality literature, presence has been identified as an important factor influencing user reactions to virtual environments (e.g., Heeter, 1992; IJsselsteijn, de Ridder, Freeman, & Avons, 2000; Sheridan, 1992; Slater & Wilbur, 1997; Steuer, 1992; Witmer & Singer, 1998). While, by and large, researchers agree on the importance of

presence, disagreement still exists about the definition. The following section will review several of the extant definitions, followed by a presentation of the conceptual framework of presence, and a description of the dimensions of presence.

2.3.1. Explication of Presence

As a unified terminology has yet to be established, scholars from a variety of domains, including psychology, communication, computer science, business, and sociology, have difficulties communicating about presence (Lee, 2004). On the highest level, there is disagreement over the use of the term "presence" versus the term "telepresence".

Steuer (1992) distinguished between presence and telepresence, in that telepresence involves a communication medium. Whereas he defined presence as "the sense of being in an environment" (p. 75, see also Biocca, 1992), he defined telepresence as "the experience of presence in an environment by means of a communication medium" (p. 76). Many researchers have since defined telepresence in similar ways; for example, Novak, Hoffman, and Yung (2000) emphasized the concept of mediation in their definition of telepresence: "telepresence, or the mediated perception of the environment, is the perception that the virtual environment with which one is interacting is more real or dominant than the actual physical environment" (p. 29). Similarly, Lombard and Ditton (1997) define presence as "the perceptual illusion of nonmediation" (Presence Explicated section, ¶1, see also IJsselsteijn & Riva, 2003; Riva, 2003). What is common among many of these definitions is the concept of "being there" (Slater, 1999); scholars such as

Welch (1999) and Biocca (1997) thus use presence and telepresence interchangeably, arguing that the same experience is underlying these concepts.

Lee (2004) presented a number of convincing arguments for the use of the term presence. First, the term presence is seen as more general than telepresence or virtual presence, making it suitable for a variety of domains and technologies, both present and future. Similarly, other scholars, such as IJsselsteijn and Riva (2003), make no distinction between the sense of presence arising from virtual or real world stimuli, arguing that "there is no intrinsic difference in stimuli arising from the medium or from the real world – the fact that we can feel present in either one or the other depends on what becomes the dominant perception at any one time" (p. 6). Second, Lee advocates using a term that is not technology-specific, as presence is a "psychological construct dealing with the perceptual process of technology-related stimuli" (p. 30), rather than being about the technology itself (see also IJsselsteijn & Riva, 2003). Third, the use of the general term presence avoids being restricted to specific phenomena (such as feelings of transportation to a virtual environment), which would limit the range of technologies and domains that can be studied. Finally, even a natural experience can be regarded as being mediated, as this perception is the "subjective interpretation of sensory stimuli" (p. 30, see also Zimbardo & Gerrig, 2000). This dissertation will follow Lee's argumentation and use the overarching term "presence".

As alluded to, researchers have defined presence in a variety of different ways. Reviewing the literature, Lombard and Ditton (1997) identified six distinct conceptualizations, namely "presence as social richness," "presence as realism,"

"presence as transportation," "presence as immersion," "presence as social actors within a medium," and "presence as medium as social actor."

The first conceptualization, presence as social richness, relates to the "extent to which a medium is perceived as sociable, warm, sensitive, personal or intimate when it is used to interact with other people" (Lombard & Ditton, 1997, Presence as social richness section, ¶ 1). This conceptualization is primarily used in studying social presence (e.g., Markus, 1994; Short, Williams, & Christie, 1976), media (or information) richness (Daft, Lengel, & Trevino, 1987; Daft & Lewin, 1993; Rice & Gattiker, 2001), or media selection (Dennis & Kinney, 1998; Webster & Trevino, 1995) in the information systems and communications disciplines.

The second conceptualization, presence as realism, has traditionally been used by scholars in the area of human factors engineering, and is concerned with the ability of the medium to produce accurate representation of objects with high fidelity (Lombard & Ditton, 1997). Typical research includes the study of television (Hatada, Sakata, & Kusaka, 1980), or the realism of virtual reality environments (Heeter, 1992). The general use of this conceptualization has been criticized by Lombard and Ditton, as it fails to distinguish between to types of realism, namely, social realism and perceptual realism. Social realism is the degree to which the portrayal of the real world is "true to life," in other words, the degree to which it "reflects events that do or could occur in the nonmediated world" (Lombard & Ditton, 1997, Presence as realism section, ¶ 1). In contrast, perceptual realism is concerned with whether an object looks and sounds as it would if it would indeed exist; in other words, the object can, but does not need to have a

physical counterpart. For example, certain TV series may be low in perceptual realism, but high in social realism. On the other hand, science-fiction movies can be high in perceptual realism, but low in social realism (Kumar & Benbasat, 2002).

The third conceptualization, presence as transportation, refers to the reduction in perceived physical distance between the user and an object (or place, or interaction partner). Specifically, three distinct types of transportation are identified, namely the perception of whether a user is transported to another place ("you are there"), another object or place is transported to the user ("it is here"), or whether interaction partners have been transported to a shared place ("we are together").

The fourth conceptualization, presence as immersion, refers to the extent that the user is perceptually or psychologically immersed (Lombard & Ditton, 1997). Perceptual immersion is often achieved using virtual reality systems, where ambient stimuli are reduced, while providing the users' senses with input. Objectively, this can be measured by counting the inputs provided by the virtual environment, and the ambient stimuli that are "shut out" (Kim, 1996). Psychological immersion refers to the degrees to which users are immersed in and involved with the virtual stimuli (Heeter, 1992).

Next, Lombard and Ditton (1997) identified presence as social actor within a medium. Here, mediated entities are incorrectly and illogically perceived as social actors, such as is the case with characters in television (Horton & Wohl, 1956; Lemish, 1982; Lombard, 1995). For example, users respond to virtual actors such as Microsoft's Office Assistant, or the Tamagotchi virtual pets in ways that can be compared to responses to a "real" social actor (Kumar & Benbasat, 2002).

The final conceptualization, presence as medium as social actor, refers to users' social responses to the medium itself. In other words, whereas the prior conceptualization refers to responses to entities within the medium, this conceptualization refers to the medium itself. In a series of studies, researchers have shown that (even experienced) computer users respond to computers as social entities (Moon & Nass, 1998; Nass & Moon, 2000; Nass, Moon, & Carney, 1999; Nass, Moon, Fogg, Reeves, & Dryer, 1995).

What these conceptualizations have in common, is what Lombard et. al (2000) term "perceptual illusion of nonmediation" (p. 77). In other words, according to Lombard and Ditton, the user "fails to perceive or acknowledge the existence of a medium in his/her communication environment and responds as he/she would if the medium were not there" p. 77). However, this (negative) normative connotation has subsequently been criticized by Lee (2004) on the basis of presence being a desirable psychological phenomenon. Consequently, Lee defined presence as "a psychological state in which virtual (para-authentic or artificial) objects are experienced as actual objects in either sensory or nonsensory ways" (p. 37). One important component of this definition is the distinction between para-authentic and artificial objects, where para-authentic objects are objects that have a connection with the actual objects they are representing. This is contrasted with artificial objects, which do not have a real-life counterpart. Further, this definition accounts for past, present and future technologies that enable presence. The dimensions of presence will be discussed in the following section.

2.3.2. Dimensions of Presence

Research has shown that people can feel present in a variety of different situations, and when interacting with different media; for example, presence can occur when one is immersed in reading a book, watching a film on a large screen television (e.g., Kim & Biocca, 1997) or watching a movie in an IMAX theater (e.g., Davide & Walker, 2003), implying that presence may be multidimensional (Witmer & Singer, 1998); the number and content of the dimensions depend on the researcher's chosen context and ontological stance (Mantovi & Riva, 1999). Three broad types of presence emerge, namely physical, social, and self presence (Lee, 2004). Self presence and social presence are concerned with the experience of the self and social actors, respectively, and are thus not the focus of this dissertation. In contrast, physical presence, concerned with the experience of physical objects, is highly relevant in the context of this dissertation. Following Lee (2004), physical presence is defined as "a psychological state in which virtual (para-authentic or artificial) physical objects are experienced as actual physical objects in either sensory or nonsensory ways" (p. 37).

Especially in the domain of virtual reality research, scholars have focused on creating virtual environments that immerse the user and look and feel like their physical counterparts (e.g., Slater, 1999; Witmer & Singer, 1998). This focus also included an emphasis on transportation as a requirement for presence. However, especially in low-tech environments (such as desktop VR), a sense of transportation is unlikely to arise. The current definition of physical presence does not include this requirement for a sense of transportation, and is thus well suited for this study. The following section will provide

a description of a framework used in the current presence literature (IJsselsteijn & Riva, 2003).

2.3.3. Presence Framework

Over the years, a variety of factors influencing presence have been proposed (e.g., Barfield & Hendrix, 1995; Held & Durlach, 1992; Sheridan, 1992). These factors can be generally grouped into two broad categories, media characteristics and user characteristics (IJsselsteijn & Riva, 2003); alternatively, these two categories can be regarded as "external" (objective) and "internal" (subjective) characteristics, respectively (IJsselsteijn & Riva, 2003; see also e.g., Slater, 1999).

Researchers have also examined the effects of presence on a variety on outcomes, such as learning (Da Bormida & Lefrere, 2003; Mantovani & Castelnuovo, 2003), collaboration (Farshchian, 2003), creativity (Waterworth & Waterworth, 2003), health care (Riva, 2002; Riva, 2005), psychotherapy (Rothbaum & Hodges, 1999), and industrial applications (Hofmann & Bubb, 2003). Related to the context of the current study, Grigorovici (2003) and Nicholson (2005) examined the effects of presence on persuasion.

The following sections will discuss various external and internal determinants of presence, followed by a discussion of the outcomes of presence.

2.4.External Determinants of Presence

External determinants are determinants associated with the medium (IJsselsteijn & Riva, 2003); in other words, these determinants are "objective" in that the designer of

the medium can modify the interface or environment in order to maximize the effect on presence. These external characteristics can further be grouped into media form and media content characteristics (IJsselsteijn & Riva, 2003), which will be discussed in the following paragraphs.

2.4.1. Media Form Characteristics

Related to media form, Sheridan (1992) suggested that a person's ability to modify the virtual environment would influence presence. Similarly, Steuer (1992) proposed vividness and interactivity as media form characteristics believed to influence presence. This conceptualization has recently been adopted by several researchers in the field of information systems, for example by Jiang and Benbasat (2004-2005), who regard interactivity and vividness as powerful enablers of VPEs.

2.4.1.1. Vividness

Vividness, defined by Steuer 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, p. 81), can be influenced by breadth, which is determined by the quantity of sensory channels employed, and depth, which is influenced by the bandwidth available.

The bandwidth is determined by factors such as the user's internet connectivity, which are often beyond the control of the medium's designers. On the other hand, multimedia technology, providing rich "language and complementary cues" (Jiang & Benbasat, 2004-2005, p. 116), can be implemented by the designer of the medium.

Examining the medium's breadth, Jiang and Benbasat (2004-2005) suggested multimedia as the enabling technology for vividness, as it can create a "[rich] symbolic system of communication" (Lim & Benbasat, 2000, p. 118). Facilitating the representation of an object's reactions to user input, multimedia technology (and the generated vividness) is an essential enabler of VPEs (Jiang & Benbasat, 2004-2005).

Examining the effects of vividness, researchers in Marketing (e.g., Coyle & Thorson, 2001; Klein, 2003) found support for the effects of vividness on presence and consumer responses (i.e., attitudes and intentions). Further, multimedia can enhance affective reactions of online shoppers, while at the same time aiding in understanding and learning. Thus, vividness can be regarded as an important factor in VPEs.

Especially related to the bandwidth available, a certain level of vividness is required for VPEs. However, varying degrees of vividness (such as the inclusion of auditory, haptic, or even olfactory cues) heavily depend on the user's hardware. Thus, the focus of the current study will be on interactivity, while vividness will be held constant across conditions.

2.4.1.2. Interactivity

Enabled by 3D-technology, a medium's interactivity is determined by the degree to which it allows a user to modify and interact with the virtual environment. Accordingly, interactivity can vary in degree and type (Lombard & Snyder-Duch, 2001). Analogous to multimedia technology seen as the enabler of vividness, Jiang and Benbasat

(2004-2005) argue that direct manipulation is the underlying technology enabling interactivity.

In VPEs, interactivity can be increased in two ways, specifically, by providing visual control and functional control. Visual control allows a consumer to examine the visual characteristics of a product, using features such as 360-degree rotation, panning, or zoom (Jiang & Benbasat, 2004-2005). Functional control, on the other hand enables a consumer to explore the functionality of a product. For example, functional control allows the user to scroll through menu options of a digital camera on Kodak's web site, open or close a cell phone on the T-mobile web site, and the like.

2.4.2. Media Content Characteristics

The second class of external determinants of presence is the content presented through the medium (IJsselsteijn & Riva, 2003). Depending on the application, this could be the environment, the actors, or the objects presented, as well as the narrative, or logical flow of events (IJsselsteijn & Riva, 2003). In the case of VPEs, the single most important media content characteristic is the product being presented. Clearly, presence will increase when interacting with products affording more possibilities for interaction (IJsselsteijn et al., 2000). The following paragraphs will discuss the product characteristics most suited to being represented in VPEs.

In the past, scholars have attempted to categorize products based on different dimensions. For example, Nelson (1970; 1974) differentiated between search and experience qualities of goods, where search qualities were defined as product

characteristics which could be determined (at reasonable cost) prior to the purchase. Experience qualities were defined as product characteristics that could not be determined prior to purchasing the product (or not be determined at a reasonable cost), but could instead only be assessed after using the product. Darby and Karni (1973) extended Nelson's classification by adding credence qualities (see also Ford, Smith, & Swasy, 1988; 1990). Credence qualities are product characteristics that cannot easily be determined, not even after purchasing the product. As many products contain a mix of search, experience, and credence qualities, several researchers have classified products according to their *dominant* qualities (e.g., Klein, 1998). Ford, Smith, and Swasy (1988) noted that whether or not an advertising claim is related to a search, experience, or credence quality to some degree depends on the expertise of the user. Further, Klein (1998) argued that new media such as the Internet can shift certain attributes from experience to search qualities, as the new media used can enable users to virtually evaluate and experience products prior to the actual purchase.

Li, Daugherty, and Biocca (2002; 2003) proposed to classify products according to the senses employed to evaluate it. Building on McCabe and Nowlis (2003), the authors argued that for geometric goods, visual inspection is sufficient to judge the quality, whereas material goods needed to be touched to fully comprehend them. Li et al. further proposed a third category, namely mechanic products, which "consumers prefer to interact with in prepurchase inspection" (p. 50).

Lal and Sarvary (1999) distinguished between digital and nondigital product attributes according to whether or not they can be communicated electronically. For

example, attributes that can be inspected visually can in general be communicated electronically; similarly, multimedia applications enable attributes such as sound to be communicated via the Internet.

Recently, Suh and Lee (2005) integrated those dimensions and classified products as virtually high experiential or virtually low experiential, depending on whether or not the salient attributes can be effectively communicated in VPEs. Suh and Lee's classification proves helpful for the current study, as it aids in narrowing down the pool of products that are suited for VPEs. The products chosen for Studies 1 and 2 will be discussed in Chapters 6 and 7, respectively.

2.5. Internal Determinants of Presence

In addition to the external determinants, a variety of internal factors influencing presence have been suggested. Such factors include prior experience with the medium or willingness to suspend disbeliefs (IJsselsteijn et al., 2000). In the context of online consumer behavior, Nicholson (2005) tested a model including individual traits and states such as playfulness (Webster & Martocchio, 1992) and involvement (Zaichkowski, 1986) and found a significant of involvement on presence; other results were mixed. While the current dissertation does not include these factors in the model, these factors will nevertheless be measured and statistically controlled for.

2.6. Outcomes of Presence

In a variety of contexts, researchers have suggested different outcomes of presence, ranging from positive effects such as increased learning (Da Bormida &

Lefrere, 2003; Mantovani & Castelnuovo, 2003) or creativity (Waterworth & Waterworth, 2003) to negative side effects such as motion sickness or dizziness (especially in immersive VR applications). Most relevant to the current study, studies have shown that presence can have a positive outcome on consumer responses. In this context, researchers have found positive effects of presence on online consumers' beliefs and product knowledge (e.g., Li et al., 2002; Nicholson, 2005; Suh & Lee, 2005). In contrast to these cognitive reactions, affective reactions resulting from presence have not received much attention. The following sections will discuss the effects of presence on consumers' affective and cognitive reactions.

2.6.1. Affective Reactions, Cognitive Reactions, Attitudes, and Intentions

Cognitive reactions (such as Perceived Ease of Use or Perceived Usefulness) have been studied extensively in IS research (e.g., Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh & Davis, 1996; Venkatesh, Morris, Davis, & Davis, 2003), but information systems research on affective reactions has been sparse (Sun & Zhang, 2006). For example, research incorporating the Technology Acceptance Model (Davis, 1989) relies primarily on Fishbein and Ajzen's (1975) expectancy-value model, where an attitude about an object is based on the summation of the expected values of an object's attributes. While such expectancy-value models are purely cognitively driven (Fazio & Olson, 2003), researchers have demonstrated that both cognition and affect can exert a strong influence on attitudes (Breckler & Wiggins, 1989; Crites, Fabrigar, & Petty, 1994; Fabrigar & Petty, 1999; Zajonc & Markus, 1982).

In contrast to research in information systems, marketing research on *affect* (e.g., Havlena & Holbrook, 1986; Mano, 1991; Mano & Oliver, 1993; Pham, 1998) has seen tremendous growth over the past decade (Cohen, Pham, & Andrade, 2007). However, the term affect is not always used consistently throughout the literature. While the term affect is sometimes used to refer to the evaluative component of attitudes, this dissertation follows the current view of affect as an "internal feeling state" (Cohen et al., 2007). Russell and Carroll (1999) make this distinction clear by stating: "by *affect,* we have in mind genuine subjective feelings and moods (as when someone says, 'I'm feeling sad'), rather than thoughts about specific objects or events (as when someone calmly says, 'The crusades were a sad chapter in human history')" (pp. 3-4). Current scholarly thought views affect as having two primary components, pleasure and arousal (Cohen et al., 2007; Mano, 1991; Mano & Oliver, 1993; Russell, 1980; Russell & Carroll, 1999).

Cohen, Pham and Andrade (2007) discuss three distinct types of affect that are relevant in consumer research. These types are integral affect, incidental affect and task-induced affect. Integral affect, as defined by Cohen et al., "refers to affective reactions that are genuinely experienced and directly linked to the object of judgment or decision." Thus, pleasant feelings when enjoying fine food would be considered integral affect, as they are directly related to the object's features. In contrast, incidental affect (such as mood) is unrelated to the object. Finally, task-induced affect is related to the task, and could arise, for example, if a person faces information overload when reading conflicting reviews about a desired product (e.g., Garbarino & Edell, 1997).

Although evaluation (attitude) and affect were considered synonymous for a long time, affect is now generally regarded as a theoretically and empirically distinct antecedent of attitude (Cohen et al., 2007). A line of research in psychology (e.g., Breckler & Wiggins, 1989; Crites et al., 1994) and marketing (e.g., Burke & Edell, 1989; Holbrook & Batra, 1987) has demonstrated in a variety of context, and related to a variety of attitude objects, that affective reactions can predict attitudes over and above what is predicted from cognitive reactions. Cohen et al. suggest four primary underlying processes for the influence of integral affect on attitudes.

First, in line with an affect transfer explanation (MacKenzie, Lutz, & Belch, 1986), is an influence of affect on attitudes through evaluative conditioning. Cohen et al. (2007) argue that the "evaluative meaning of the feelings" are transferred to the target as a result of the proximity between the target and the experience of the feeling. The second explanation suggests that affective reactions are associated with action tendencies such as approach or avoidance; these, while not directly influencing behavior, may nevertheless influence attitudes and intentions. The third explanation follows the "how-do-I-feel-about-it?" heuristic (Schwarz, 1990; Schwarz & Clore, 1988), which has found support in both psychology (e.g., Schwarz & Clore, 1983) and marketing (e.g., Pham, 1998; Pham, Cohen, Pracejus, & Hughes, 2001). Whereas in the first two explanations, the effect of feelings is by association, or happens mechanistically, the effect in this third explanation is inferential, as "people are assumed to reflect on what their integral feelings mean for the judgment to be made" (Cohen et al., 2007). The fourth mechanism is an indirect effect of affective reactions on attitudes through an effect on the person's beliefs about an

attitude object. A person's affective reactions may either trigger certain beliefs, or may reinforce existing beliefs, which then influence attitudes (Cohen et al., 2007; MacKenzie et al., 1986).

In sum, there is broad support in the literature for the influence of both cognition and affect on attitudes, which are, in turn, believed to influence a person's intentions and behavior. According to Ajzen and Fishbein (1975), a behavioral intention is "a person's subjective probability that he will perform some behavior" (p. 288), and is influenced by factors such as a person's attitude towards the behavior and subjective norms related to performing the behavior. The hedonic and utilitarian nature of products and its influence on consumer's affective and cognitive reactions will be discussed in the next section.

2.7. Hedonic vs. Utilitarian Products

In addition to the effects of presence, the nature of a product can have an important influence on affective and cognitive reactions. While the discussions around media content distinguished between different products in terms of their suitability for being presented in an online environment, another important distinction focuses on whether a product is primarily regarded as hedonic or utilitarian. As indicated by Batra and Ahtola (1990) and Spangenberg and colleagues (Crowley, Spangenberg, & Hughes, 1992; Spangenberg, Voss, & Crowley, 1997; Voss, Spangenberg, & Grohmann, 2003), consumers purchase goods for two primary reasons. On the one hand, products are purchased for the purpose of consummatory gratification; other products are purchased for the instrumental value provided (Hirschman & Holbrook, 1982; Strahilevitz & Myers,

1998). In other words, while the former products are purchased primarily for hedonic reasons, the latter are purchased for utilitarian reasons.

Recently, researchers such as Batra and Ahtola (1990) and Spangenberg and colleagues (Crowley et al., 1992; Spangenberg et al., 1997; Voss et al., 2003) suggested that the hedonic and utilitarian components of attitude are two distinct dimensions; consequently, a given product can be high or low on either of the two dimensions. Consumers, however, tend to regard this as a single dimensions and view products as either hedonic or utilitarian, depending on the prevalent dimension. This is of importance for marketers, as consumers tend to keep hedonic products for a longer time, and companies can charge a price premium for hedonic products (Dhar & Wertenbroch, 2000). Related to this dissertation, Park et al. (1986) suggested that a brand can be *positioned* as primarily appealing to a functional, symbolic, or experiential needs. Dhar and Wertenbroch showed that the same object (in their case, an apartment) can be positioned as either hedonic or utilitarian by highlighting the hedonic or utilitarian attributes, respectively. This strategy has also been successfully used by Voss et al. (2003), who positioned a product (bath soap) as being hedonic or utilitarian.

Kempf and Smith (1998) suggested that for hedonic products, consumers' affective reactions are of special importance. However, this remained speculative, as their experiment used a virus scanner and a grammar checker, two products specifically selected for being equivalent in terms of hedonic or utilitarian nature (Kempf & Smith, 1998). Voss et al. (2003), in testing the nomological validity of their HED/UT scales, demonstrated that affective involvement predicted the hedonic dimension of brand

attitude, and cognitive involvement predicted the utilitarian dimension, which also suggests that for different products affective and cognitive reactions might be of differential importance.

2.8.Summary

This chapter has provided a literature review of presence, as well as its determinants and outcomes. First, this chapter has provided an overview of different definitions of presence, culminating in a single definition of presence. Then, a presence framework used in current research has been presented, followed by a discussion of the determinants of presence. In particular, the importance of external (media form and media content) and internal (user characteristics) determinants of presence have been highlighted. Further, this chapter has emphasized the distinction between affective and cognitive reactions, and their influence on attitudes and intentions. Finally, this chapter has discussed hedonic and utilitarian product dimensions, and their differential effects on affect and cognition. Building on the preceding discussions, the following chapter will provide a conceptual model and propositions about the different relationships.

3. Theoretical Model and Propositions

This chapter presents the conceptual model guiding the current study. The first section will introduce a general proposition about technology as an antecedent to presence. This is followed by a discussion of the affective and cognitive outcomes of presence. Then, this chapter will develop propositions about the effects of product positioning on affective and cognitive reactions. In the penultimate section, the effects of affective and cognitive reactions on attitudes and intentions are considered. Finally, the conceptual model will be presented.

3.1.Media Form

Researchers such as IJsselsteijn and Riva (2003) have grouped potential antecedents to presence into external and internal characteristics, where external characteristics are related to the form and the content of the medium. In terms of media form, direct manipulation emerges as an important component, as it offers three primary features. First, direct manipulation allows for continuous representation of the object of interest; second, when interacting with direct manipulation interfaces, users perform physical actions (such as button presses), rather than having to use complex syntax; third, the impacts of the user's operations on the object of interest is immediately visible (Shneiderman, 1984).

Considering these features of direct manipulation, Hutchins, Hollan, and Norman suggested that "manipulating a representation [of an object] can have the same effects and the same feel as manipulating the thing being represented" (1985, p. 320). Hutchins

et al. argue that feelings of directness arise as the perceived distance between the user's intentions and the object's reactions is reduced (thus reducing the user's effort), and from feelings of control over the object (if the object behaves as a real object would). Thus, direct manipulation, as a media form characteristic, can influence a user's perceptions arising from interacting with a virtual object. Further, multimedia can create a "[rich] symbolic system of communication" (Lim & Benbasat, 2000, p. 118), which is complementary to the effects of direct manipulation (Jiang & Benbasat, 2004-2005). Thus, media form characteristics will reduce a user's perceptions of a mediated interaction. From this, proposition 1 follows:

P1: Media form will influence presence.

It is acknowledged that in addition to media form characteristics, media content characteristics, internal determinants, and a host of other factors influence presence. However, these are not the focus of the current study. The next section will consider cognitive and affective reactions as important outcomes of presence.

3.2. Outcomes of Presence

Following Lee (2004), (physical) presence has been defined as "a psychological state in which virtual (para-authentic or artificial) physical objects are experienced as actual physical objects in either sensory or nonsensory ways" (p. 37). In other words, virtually represented products are perceived as real, immediate, and direct. Presence itself is seen as varying in degree, rather than being binary (Short et al., 1976). Thus, higher degrees of presence represent stronger perceptions of reality, immediacy, and directness.

For a consumer, this translates into a more direct-like experience (2003). As users tend to trust their own experiences, beliefs are more strongly held in direct experiences than in indirect experiences (Smith & Swinyard, 1988). Thus, in online shopping environments, perceptions of direct-like experiences influence cognitive reactions.

P2a: Presence will influence cognitive reactions.

In addition to cognitive reactions, direct interactions with an object tend to elicit affective reactions. For example, many people experience pleasant feelings and heightened arousal when tasting fine food or wine (Cohen et al., 2007). Similarly, Shneiderman (1983) suggested that pleasure can arise from direct interaction with an object. Affective reactions to direct experiences should be stronger than affective reactions to indirect experiences, given the vivid and personal nature of direct experience (Kempf & Smith, 1998). From this follows that direct-like experiences should positively contribute to affective reactions.

P2b: Presence will influence affective reactions.

When forming beliefs about a certain object, a person's affective reactions can play an important role as well. One explanation for this is the affect infusion model (Forgas, 1995), which argues that, depending on the cognitive strategy employed, affect is "infused" into cognition. For example, when presented with an advertising stimulus, a user may be more likely to believe the claims when he or she is in a positive mood (MacKenzie et al., 1986). Similarly, if a person is in a positive mood, he or she may perceive that something is easy to use (assuming that the person would not be in a good mood if the product was not easy to use). In information systems research, this

relationship has been studied in the context of, e.g., perceived enjoyment and perceived ease of use or perceived usefulness (Sun & Zhang, 2006; Venkatesh, Speier, & Morris, 2002). Thus, affective reactions can influence a person's cognitive reactions.

P2c: Affective reactions will influence cognitive reactions.

Consumers' affective and cognitive reactions, however, cannot be regarded as invariant. Strahilevitz and Myers (1998) distinguish between hedonic and utilitarian consumption. Specifically, they claim that "hedonic, pleasure-oriented consumption is motivated mainly by the desire for sensual pleasure, fantasy and fun", whereas "utilitarian, goal-oriented consumption is motivated mainly by the desire to fill a basic need or accomplish a functional task" (p. 436). Thus, it makes intuitive sense that products presented as relatively more hedonic have stronger effects on affective reactions, whereas products presented as relatively more utilitarian will elicit stronger cognitive reactions. Thus, P3 suggests the following:

P3: Product positioning will influence affective and cognitive reactions.

The preceding sections have discussed cognitive and affective reactions as outcomes of presence, as well as the role of product positioning. The following sections will discuss the relationships between affect, cognition, and attitudes.

3.3.Affect, Cognition, and Attitudes

When evaluating the favorableness or unfavorableness of an object (i.e., forming an attitude, Ajzen &Fishbein, 1980), people generally rely on their beliefs about the object. Classic expectancy-value models posit that attitudes are determined by a person's

beliefs, and the strength of those beliefs. Thus, if the beliefs about an object are favorable, this will lead to favorable attitudes. Consequently, P4a posits:

P4a: Cognitive reactions will influence attitudes.

Another important determinant of attitudes relates to a person's affective responses related to an object. As argued by Cohen et al. (2007), affective reactions are used as a direct input in the attitude formation process in three ways (a fourth ways suggests an indirect influence via cognitive reactions, see P2c). The first explanation is based on "affect transfer" (MacKenzie et al., 1986), where the proximity between an object and the feeling may lead to the valence of the feeling being transferred to the target object. Second, affective reactions are often associated with action tendencies (such as approach or avoidance), which are "translated into proxies of behavior" (Cohen et al., 2007). Finally, and perhaps most importantly, people evaluate their feelings about an object when trying to form an evaluation. This process, known as the "how-do-I-feel-about-it" heuristic (Schwarz & Clore, 1988), is an inferential process, in which people consciously evaluate their feelings when presented with a target object, or even form mental pictures to evaluate their feelings (Pham, 1998). When feelings are evaluated, pleasant feelings tend to lead to favorable evaluations, and unpleasant feelings lead to unfavorable evaluations. Thus, P4b posits:

P4b: Affective reactions will influence attitudes.

The preceding sections have examined the determinants of attitude. In the next section, an important outcome of attitudes, namely intentions, will be discussed.

3.4.Attitudes and Intentions

Behavioral theories such as the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) theorize that a person's behavior is determined by his or her intentions to perform that behavior, i.e. behavioral intention. Behavioral intentions, in turn, are determined by a person's attitudes as well as subjective norms. In other words, if someone evaluates an object as positive, he or she is more likely to perform an associated behavior. For example, if a product is evaluated as more positive, a consumer is more likely to purchase that product than if he or she forms a less favorable evaluation. Thus, P5 follows:

P5: Attitudes will influence intentions.

In the following section, a conceptual model is presented, followed by a summary of the propositions.

3.5.Conceptual Model

The preceding section has presented a set of propositions related to presence, media form characteristics as one of its antecedents, and its effects on affective and cognitive reactions, the effects of affective and cognitive reactions on attitudes, and the influence of attitudes on intentions. Further, the previous section has argued for an effect of product positioning on affective and cognitive reactions. Figure 1 presents the conceptual model. One important factor to note is that, again, presence is seen as a matter of degree, such that as presence increases, so do cognitive and affective reactions, attitudes, and intentions. Table 1 presents a summary of the propositions derived.

Figure 1 - Conceptual Model

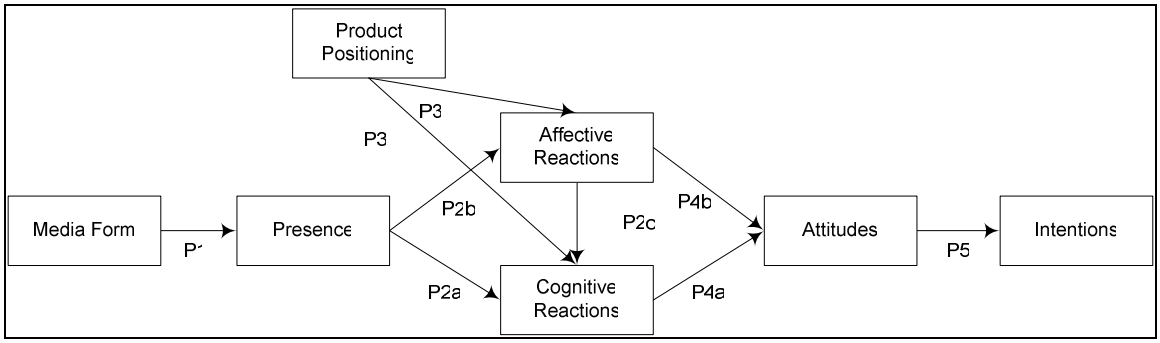


Table 1 - Propositions

	Proposition
P1	Media form will influence presence.
P2a	Presence will influence cognitive reactions.
P2b	Presence will influence affective reactions.
P2c	Affective reactions will influence cognitive reactions.
P3	Product positioning will influence affective and cognitive reactions.
P4a	Cognitive reactions will influence attitudes.
P4b	Affective reactions will influence attitudes.
P5	Attitudes will influence intentions.

4. Research Model

This chapter presents an overview of the research model, followed by a discussion of the hypotheses. Specifically, this chapter presents specific, testable hypotheses about the technological antecedents to presence, the cognitive and affective reactions to presence, the effect of product type, as well as the effects of affective and cognitive reactions on attitudes and intentions.

4.1. Hypotheses

A higher degree of interactivity will let users feel more "in control"; thus, the consumer's experiences are similar to the experiences when interacting with a real object (Klein, 2003). Higher interactivity should therefore lower the perceptions of a mediated interaction, and users interacting with a virtual product representation high in interactivity should therefore experience higher degrees of presence. Relatedly, as argued by Hutchins et al. (1985), direct manipulation reduces perceived distance between the user's intentions and the object's reactions and the user feels more in control of the object. Direct manipulation therefore will reduce a consumer's perceptions of a mediated interaction. It is hypothesized that:

H1: Increased interactivity will lead to increased presence perceptions.

Researchers in the area of social psychology and consumer behavior have theorized about the effects of advertising as compared to direct product experience. According to Smith and Swinyard, (1988), a person trying out a product him- or herself is more likely to believe his or her own experience than an advertising claim due to higher

levels of source credibility. Klein (2003) conceptualized a virtual experience as a direct-like experience, being closer to the real experience than advertising is to a real experience. A higher degree of presence should therefore influence cognitive reactions, in that it will produce greater belief strength about a product.

H2a: Increased presence will positively influence cognitive reactions.

Research in consumer behavior has shown that indirect experiences (such as advertising) can generate affective reactions (Burke & Edell, 1989; Edell & Burke, 1987). In contrast to indirect experiences, direct experiences are more vivid and personal (Kempf & Smith, 1998), and should thus elicit more affective reactions. Compare this to reading about the food at a fine-dining restaurant, and actually tasting it. Given the actual food holds what the restaurant promises, the actual, direct experience will lead to more affective reactions. Analogously, direct-like experiences (such as virtual product representations) can be considered more vivid and personal, and should thus elicit more affective reactions (Mano & Oliver, 1993). Thus, it is hypothesized that:

H2b: Increased presence will positively influence affective reactions.

Proposition 2c argued that affective reactions influence cognitive reactions. In the context of the current study, this implies that consumers form their beliefs not only based on the product's features, but also on their current feelings. Thus, beliefs such as ease of use are at least partly influenced by a consumer's feelings. For example, if a consumer experiences pleasant feelings while interacting with a computer, he or she is likely to consider it easy to use (as otherwise, he or she would not experience such feelings).

Further, affective responses may bias cognitive reactions; for example, if a consumer experiences unpleasant feelings, the consumer is less likely to believe the claims about the product. From this, it follows that:

H2c: Affective reactions will positively influence cognitive reactions.

Proposition 3 argued that product positioning influences cognitive and affective responses. As Strahilevitz and Myers (1998) argued, hedonic consumption is targeted at pleasure and fun (see also the experiential view of consumption, Hirschman & Holbrook, 1982). In other words, a product presented as enjoyable and fun is likely to elicit more affective reactions than a product that is presented in a very utilitarian way. This leads to the hypothesis that:

H3a: Products positioned in a hedonic way will elicit stronger affective reactions than products positioned in a utilitarian way.

Along the same lines, Strahilevitz and Myers (1998) argued that utilitarian consumption is very goal directed, as the primary goal is the desire to fill a basic need or accomplish a functional task. Thus, if a product is presented in a more utilitarian way, a consumer is more likely to focus on the utilitarian aspects of the product. Cognitive responses thus become central in the attitude formation process. As compared to products positioned in a hedonic way, cognitive reactions should be stronger for products presented in a utilitarian way.

H3b: Products positioned in a utilitarian way will elicit stronger cognitive reactions than products positioned in a hedonic way.

Proposition 4a suggested that cognitive reactions will influence attitudes. Following Ajzen and Fishbein (1980), a person's attitudes are determined by the salient beliefs about an object, and the strength of these beliefs. In the present context, a consumer holds specific beliefs about a product; depending on the way these beliefs were formed, the consumer may hold these beliefs with different strength. Ajzen and Fishbein argued that a person's attitudes can be determined from the salient beliefs and the belief strength (i.e., the consumer's cognitive reactions). Thus, it is hypothesized that:

H4a: Cognitive reactions will positively influence attitudes towards a product.

Similarly, proposition 4b suggested that affective reactions influence attitudes. Schwarz and Clore (1988) offered the "how-do-I-fee-about-it" heuristic to explain potential effects of affective reactions on attitudes. When a consumer is trying to form an attitude (i.e., a summary evaluation) about a product, he or she is likely to evaluate his feelings about the product. In that process, pleasant feelings translate into favorable attitudes, whereas unpleasant feelings translate into less favorable attitudes (Cohen et al., 2007). Similarly, Petty, Gleicher, and Baker (1991) argued that affect can serve as an input into the attitude formation process in different ways, under different conditions of elaboration likelihood. Additionally, through an "affect transfer" mechanism, feelings may be transferred to an object that is presented simultaneously (Cohen et al., 2007). Thus, it is hypothesized that:

H4b: Affective reactions will positively influence attitudes about a product.

Proposition 5 suggested that attitudes influence intentions. In a consumer behavior context, the attitudes about a product are commonly hypothesized as influencing

intentions to purchase (Coyle & Thorson, 2001). In other words, the more favorable a person's evaluations of a product are, the more likely he or she is to purchase that product. Thus, it is hypothesized that:

H5: Attitudes toward a product will positively influence purchase intentions.

Table 2 summarizes the hypotheses developed.

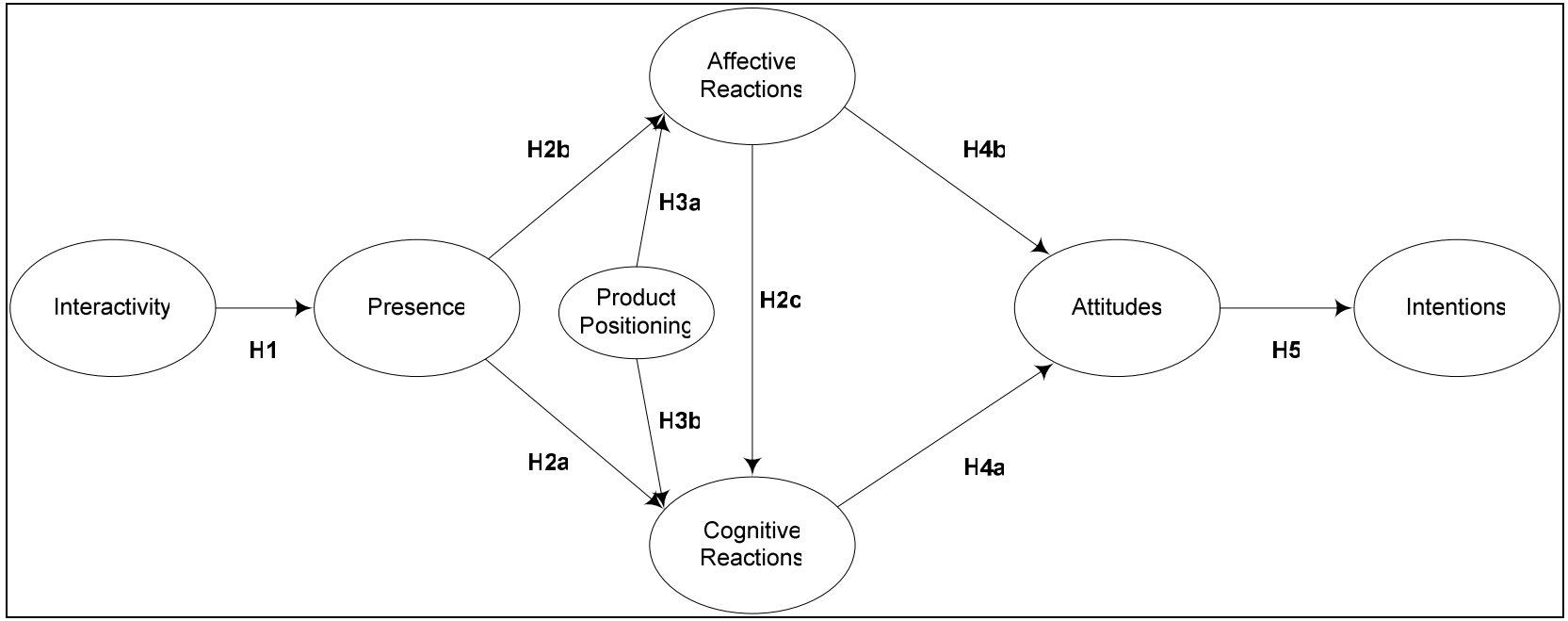
Table 2 - Summary of Hypotheses

	Hypothesis
H1	Increased interactivity will lead to increased presence perceptions.
H2a	Increased presence will positively influence cognitive reactions.
H2b	Increased presence will positively influence affective reactions.
H2c	Affective reactions will positively influence cognitive reactions.
H3a	Products positioned in a hedonic way will elicit stronger affective reactions than products positioned in a utilitarian way.
H3b	Products positioned in a utilitarian way will elicit stronger cognitive reactions than products positioned in a hedonic way.
H4a	Cognitive reactions will positively influence attitudes toward a product.
H4b	Affective reactions will positively influence attitudes toward a product.
H5	Attitudes toward a product will positively influence purchase intentions.

4.2.Summary

This chapter has developed a set of testable hypotheses related to the effects of interactivity and product positioning on presence, affective, and cognitive reactions, as well as related to attitudes and intentions (see Figure 2). The next chapter will describe the methodology employed to test these hypotheses.

Figure 2 – Research Model



5. Research Methodology

Two studies were designed to test the hypotheses discussed in the previous chapter. This chapter will provide a brief overview of the research methods chosen. Then, the chapter will present the data analysis strategy.

5.1. Research Methods

To test the hypotheses, it was chosen to conduct a laboratory experiment (Study 1), followed by a field experiment (Study 2). Laboratory experiments are often criticized to suffer from artificiality, low realism, and little generalizability. However, this artificiality is often regarded as a virtue, as it can help to increase precision (Dennis & Valacich, 2001; McGrath, 1982; Mook, 1983), which, in turn, helps in theory testing.

A second concern related to laboratory experiments is the use of student subjects. Many scholars argue that the use of student subjects may limit a study's generalizability (e.g., Lynch, 1982; 1999), and that, for example in consumer research, students do not represent "real costumers" in many dimensions due to different financial situations, priorities in life etc. (Wells, 1993; 2001; Winer, 1999). On the other hand, scholars such as Henshel (1980) and Mook (1983) argue that the homogeneity of the subjects can provide a stronger test of the theory (Calder, Phillips, & Tybout, 1982; see also Calder & Tybout, 1999). In fact, scholars dismissing the use of student subjects possibly commit a fundamental attribution error by ascribing certain effects to the use of student subjects (Kardes, 1996).

This dissertation addresses these issues in two primary ways. First, a task was chosen that was very relevant to the subjects; namely, they were asked to visit the website containing a product offering, similar to the site of an online retailer or a manufacturer. Given that the subject population consists of heavy internet users (Hoffman, Novak, & Venkatesh, 2004), this task is very salient. The use of a different product in Study 2 helps to test the theory in a different setting, and the use of "real" commercial stimuli in both studies helped to increase the degree of realism. Second, this dissertation addressed the issues related to the use of student subjects by using two studies, one laboratory experiment using student subjects (Study 1), and one field experiment using non-traditional (distance education) students as well as non-student subjects (Study 2). Specifically, in Study 2, the subjects were asked to recruit additional (non-student) subjects to participate in the experiment.

5.2.Data Analysis Strategy

Structural equation modeling (SEM) was used to analyze the experimental data, as it has been suggested to have a variety of advantages over other, more traditional analysis techniques such as multiple regression. First, SEM permits to simultaneously assess the relationships between latent constructs and their indicators, and the hypothesized causal linkages between the latent constructs (e.g., Byrne, 2001; Tomarken & Waller, 2005). In other words, SEM permits the simultaneous assessment of both the measurement model and the structural model. Second, SEM can provide tests of complex models with a large number of linear equations. This is in contrast to alternative techniques such as regression, which can only be used to test small components of a

complex overall model (Tomarken & Waller, 2005). Further, by explicitly estimating error variance parameters, SEM can correct for these errors, which has been suggested to be a key advantage over other statistical procedures, such as regression (Byrne, 2001). Finally, one strength of SEM is that it takes a strictly confirmatory approach to hypothesis testing by allowing the researcher to "directly test the model of interest rather than a straw man alternative" (Tomarken & Waller, 2005, p. 35). In other words, rather than testing the null hypothesis that two population means are equal, the null hypothesis in SEM specifies that the model holds in, or closely represents, the population (MacCallum, Browne, & Sugawara, 1996; Tomarken & Waller, 2005).

The hypothesis of close fit is usually tested by either evaluating the χ^2 goodness-of-fit statistic, or using a variety of fit indexes (Hu & Bentler, 1999). Both the χ^2 goodness-of-fit statistic, and the fit indexes are calculated based on the discrepancy between the covariance matrix implied by the model and the sample covariance matrix (Tomarken & Waller, 2005). The less the discrepancy, the better the fit.

The χ^2 goodness-of-fit statistic, while widely used, has several major shortcomings. First, it is heavily dependent on sample size. While an increased sample size helps to increase statistical power, an increase in sample size also increases the probability of rejecting *any* model, even when the discrepancies between the model and the data are trivial (Bagozzi & Yi, 1988; Bentler & Bonett, 1980). Further, as a nonsignificant χ^2 value is desired, the null hypothesis implies that there is no difference between model and data; the researcher is therefore essentially trying to prove the null hypothesis. This can prove problematic, as researchers may attempt to increase the

chances of having a nonsignificant χ^2 value by reducing sample size (Bentler & Bonett, 1980).

In response to the issues associated with the χ^2 goodness-of-fit statistic, a variety of absolute and comparative fit indexes have been developed to assess model fit. On the one hand, absolute goodness-of-fit indexes (such as the Goodness-of-Fit Index (GFI), the Root Mean Squared Residual (SRMR), or the Root Mean Square Error of Approximation (RMSEA)) assess "how well an a priori model reproduces the sample data" (Hu & Bentler, 1999, p. 2); on the other hand, incremental fit indexes (such as the Normed Fit Index (NFI) or the Comparative Fit Index (CFI)) compare the model of interest with another (usually more restricted) baseline model (Bentler, 1990; Bentler & Bonett, 1980). Usually, the correlations of the variables are fixed at zero in this baseline model, indicating that all variables are assumed to be uncorrelated (Hu & Bentler, 1999).

To assess model fit, researchers use different cutoff values for a variety of fit indexes. As these cutoff values are often based on somewhat arbitrary rules of thumb, researchers such as Hu and Bentler (1998; 1999) or Marsh, Hau, and Wen (2004) have conducted simulation studies to assess the effects of different cutoff values on type I and type II error rates. In their analysis, Hu and Bentler (1998) found that CFI and RMSEA were most sensitive with respect to misspecified factor loadings and the SRMR was most sensitive to misspecified factor covariances and latent structures. Further, some fit indexes including NFI, GFI, and AGFI performed so poorly in their analysis that their use in evaluating model fit was not recommended. Based on their findings, a two-index strategy was suggested, consisting of reporting the SRMR along with a second index such

as CFI or RMSEA. Recommended cutoff values for concluding a relatively good fit between model and data were "close to .95" for the CFI, "close to .08" for the SRMR, and "close to .06" for the RMSEA (Hu & Bentler, 1998; 1999). However, Hu and Bentler's findings are not without criticism, and it has been suggested that "it may be unreasonable to have more than two or three items per factor if researchers hope to achieve GOF indexes of .95, but that it is highly desirable if researchers want to have measures with good construct validity" (Marsh et al., 2004, p. 325). Overall, the issues associated with model fit are very complex; Tomarken and Waller stated that "even under the best of circumstances a healthy dose of subjectivity is involved in determining whether a model fits well" (p. 54). In light of the ongoing debate about model fit, the following fit indexes will be reported: χ^2, χ^2/df, SRMR, CFI, and RMSEA.

The analyses were performed in EQS 6.1 (Build 91) using maximum likelihood estimation. As research in the social and behavioral sciences almost always suffers from significant violations of the assumptions of normality (Micceri, 1989), robust estimation was used to address violations of multivariate normality (Bentler, 2004). Following the analyses in EQS, the analyses were repeated using AMOS 7.0 to ensure that the results were consistent across the statistical packages. The use of command syntax in EQS and the graphical user interface in AMOS helped to ensure that the model had been correctly built by cross-checking degrees of freedom, fit indexes, and parameter estimates. The convergent results across statistical packages further helped to increase confidence in the results.

5.3. Summary

This chapter presented the research methodology. Two studies will be employed to test the hypothesized model. Specifically, Study 1 uses a controlled laboratory experiment. Study 2 uses a field experiment to address shortcomings associated with laboratory experiments. Further, this chapter has argued for the use of structural equation modeling techniques for data analysis, which allows for testing complex models. The following two chapters will present Study 1 and Study 2.

6. Study 1

Study 1 consisted of a controlled laboratory experiment to test the effects of interactivity on presence, as well as the effects of presence on affective reactions, cognitive reactions, attitudes, and intentions. Further, Study 1 was designed to test the differential effects of product positioning on affective and cognitive reactions.

6.1.Design

Study 1 used a 2 × 2 design, manipulating interactivity and product positioning. To test the hypothesized effects, a website presenting a Kodak EasyShare V610 digital camera was created. A digital camera was chosen for two primary reasons. First, a digital camera has been successfully used in prior studies examining the effects of interactivity (Nicholson, 2005; Schlosser, 2003; 2006). Second, a digital camera can be considered a virtually high experiential product (Suh & Lee, 2005), as it allows for meaningful interaction by offering a variety of features that can be effectively presented in an online context.

For Study 1, four different versions of the same web site were designed, differing in interactivity (interactive versus static) and product positioning (hedonic versus utilitarian). The interface in each condition consisted of a page presenting the camera's different menu options, and one page offering the ability to view the camera from different angles. Both pages were used to manipulate interactivity. Further, the interface in each condition contained advertising copy intended to manipulate the product's positioning. The manipulations will be discussed in more detail below.

6.2. Pre-test

A pretest was conducted to test the interface, and to provide preliminary results. This pretest was conducted using students from an upper-level course in management information systems. The pretest demonstrated the efficacy of the experimental manipulations. However, the subjects spent less time than expected interacting with the virtual product representation.

6.3. Sample

The sample consisted of undergraduate students enrolled in an introductory course in management information systems at Washington State University. This course is a requirement for all business students; thus, subjects came from a variety of majors.

6.4. Procedures

The experiment took place in a classroom equipped with 48 networked workstations. Each station had a Dell Personal Computer running Windows XP and Internet Explorer 7, a 17 inch flat panel monitor (resolution 1024x768), a keyboard, and an optical mouse. Each computer was equipped with a 1.7 gigahertz Intel Pentium 4 processor, 256 MB RAM, a 37.2 GB hard drive, and a 10/100 Ethernet card.

Upon reporting to the experimental site, each participant was assigned to a workstation. Once all subjects had reported to the site, the experimenter read the experimental script. After giving informed consent, the subjects were directed to the experimental manipulation.

6.5.Experiment

During the pretest, the experimental subjects spent only limited time interacting with the virtual product representation. Thus, the study was modified to include a series of 15 multiple-choice questions that required interacting with the virtual product representation. Following the series of questions, the subjects were directed to a follow-up survey, which will be discussed in the next section.

6.6.Measures

This section discusses the various independent, dependent and control variables used in Study 1. These variables were also used in Study 2 (albeit in modified form in some cases). All scales are presented in Appendix A.

6.6.1. Independent variables

The independent variables in this study consisted of the experimental manipulations. While variables such as involvement and playfulness have been used as independent variables in prior work (Nicholson, 2005), these are not the main focus of this dissertation. Rather, they were measured and are used as control variables. The following paragraphs will describe the experimental manipulations, namely, interactivity and product positioning.

6.6.1.1. Product Positioning

Product positioning refers to presenting a product in a way that makes the consumer regard it as primarily hedonic or utilitarian. In other words, the product is

presented in a way that it appeals to a consumer's functional or experiential needs (Park et al., 1986; Voss et al., 2003). Following Voss et al., different statements were used to position the product, where utilitarian positioning statements highlight the product's functional features (see Figure B - 1), whereas hedonic positioning statements highlight the product's experiential aspects (see Figure B - 2). As argued by Voss et al., positioning strategies can be more effective if referent brands are used. For Study 1, Canon (the market leader) was used as the referent brand. See Appendix B for the different interfaces.

The efficacy of the manipulation was assessed following the approach used by Dhar and Wertenbroch (2000). First, the respondents were asked to assess the product on the hedonic and utilitarian dimensions separately, using the 10-item, 7-point Likert-type Hed/Ut scale (ranging from 1-7) developed by Voss et al. (2003). The final manipulation check consisted of the difference between the mean of the hedonic and the mean of the utilitarian scores. Thus, the resulting scale ranged from +6 to -6, where a value of +6 indicated that the product was perceived as purely hedonic, and a value of -6 indicated that the product was perceived as purely utilitarian; a value of 0 indicated that the product was considered equally hedonic and utilitarian, or neither hedonic nor utilitarian (see Dhar & Wertenbroch, 2000).

6.6.1.2. Interactivity

For the purposes of this study, interactivity is defined as the user's ability to exert visual and functional control (Jiang & Benbasat, 2003) over a virtually represented product. As discussed above, there were two levels of interactivity (interactive versus static). The interactivity manipulation was operationalized in two ways.

First, instantiating functional control, the page presenting the camera's menu options was modified such that in the *static* condition, the subjects were presented with the relevant information in tabular form (see Figure B - 3). In the *interactive* condition, the subjects could use the mouse to click the camera's buttons in order to scroll through the menus. When scrolling, an image of the camera's menu reacted accordingly (see Figure B - 4).

Second, instantiating visual control, interactivity was manipulated using the page displaying the camera. In the *static* condition, the subjects were presented with 10 static pictures of the camera from different angles, similar to the way products are presented on web sites of online retailers such as Amazon.com (see Figure B - 5). In the *interactive* condition, the subjects were presented with an interactive Holomatix 3D-based interface that allowed rotating the camera to view it from all angles (see Figure B - 6). As indicated by Lee and Benbasat (2003), characteristics of images can influence online shoppers' reactions to the products presented. Thus, care had to be taken to avoid any potential confounding effects due to image presentation. Thus, screenshots taken from the 3D interface served as static images to control for image resolution and size. Examples of the different interfaces are presented in Appendix B.

As a manipulation check, perceived interactivity was measured using four 7-point Likert-type items assessing the extent to which the subjects perceived the interface to be interactive (Nicholson, 2005).

6.6.2. Control Variables

This section presents the primary control variables. While some of the control variables, i.e., content, product class knowledge, VR knowledge, gender, product involvement, and computer playfulness have been included in prior studies (e.g., Nicholson, 2005), variables such as need for tactile input or style of processing may also have an influence on users' presence. Thus, these measures were included in the Study 1 as well.

6.6.2.1. Content

Based on Suh and Lee's (2005) work, it was deemed important to choose a product that could be considered virtually high experiential, and that was viewed as equally hedonic and utilitarian to facilitate product positioning. Following prior studies (Nicholson, 2005; Schlosser, 2003; 2006), it was decided to use a product from the category of consumer electronics. The choice fell on a digital camera, as it had been successfully used in prior studies, had highly digitizable attributes, and was regarded as balanced in terms of the utilitarian and hedonic dimensions, as shown in a pre-test. The same product (a Kodak EasyShare V610) was used in all conditions.

6.6.2.2. Product Class Knowledge

Smith and Park (1992) defined product class knowledge as the "amount of knowledge consumers believe they have about the focal product class" (p. 304); in this case, the focal product class is digital cameras. Nicholson (2005) derived a 5-item measure of product class knowledge based on Smith and Park's product class knowledge

scale. The items use a 7-point Likert-type response format, anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.2.3. Virtual Reality Knowledge

Analogous to product class knowledge, virtual reality knowledge is defined as the amount of knowledge consumers believe they have about virtual reality technology. Virtual reality knowledge was measured using Nicholson's (2005) 5-item scale (based on Smith & Park, 1992), which used a 7-point Likert type scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.2.4. Gender

Subjects' gender was measured using a single self-report item.

6.6.2.5. Need for Tactile Input

One trait potentially influencing presence is the consumer's need for tactile input. Citrin, Stem, Spangenberg, and Clark (2003) argued that one impediment of e-commerce success is the consumers' inability to experience products as they would in the offline word, primarily due to lacking the ability to touch the products. Citrin et al. further argued that consumers' need for sensory experience during product evaluation (i.e., the need for tactile input) may differ between people, and developed a scale to measure need for tactile input, which was used in this study. This scale consisted of six 7-point Likert-type items anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.2.6. Style of Processing

Childers, Houston, and Heckler (1985) argued that people may differ in their style of processing, which may influence cognitive processing. The dimensions identified were imagery vividness, imagery control, and imagery style, where imagery vividness referred to the clarity of mental images, imagery control referred to a person's ability to manipulate a self-generated metal image, and imagery style referred to a person's propensity to engage in imaginally (as opposed to verbal) processing (Childers et al., 1985).

Based on Childers et al.'s (1985) work, Bezjian-Avery, Calder, and Iacobucci (1998) assessed whether people's processing style is relatively more verbal or visual. This instrument, containing of four Likert-type items related to visual orientation and four Likert-type items related to verbal orientation was used to measure processing style. The items were measured on a 7-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.2.7. Product Involvement

Zaichkowski (1985) defined involvement as "a person's perceived relevance of the object based on inherent needs, values, and interests" (p. 342), and developed a 20-item personal involvement inventory (PII). For the purpose of the current study, the use of this measure was deemed infeasible due to problems such as redundant items (Zaichkowski, 1994) and lack of unidimensionality (Mittal, 1995), and the desire to reduce the overall length of the questionnaire to minimize fatigue. Therefore,

involvement was measured using a modified version of the PII, developed by Mittal (Mittal, 1995). Mittal's scale uses 5 semantic differential items, measured on a 7-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.2.8. Computer Playfulness

Webster and Martocchio (1992) defined computer playfulness as the "degree of cognitive spontaneity in microcomputer interactions" (p. 204), and developed a 7-item scale consisting of Likert-type items. All items were measured on a 7-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.3. Dependent variables

6.6.3.1. Presence

Following Lee (2004), physical presence is defined as "a psychological state in which virtual (para-authentic or artificial) physical objects are experience as actual physical objects in either sensory or nonsensory ways" (p. 37). Presence was measured using items adopted from Lessiter et al.'s (2001) ITC-Sense of Presence Inventory (ITC-SOPI). The original instrument consists of 44 Likert-type questions related to the user's experience during and after interacting with a virtual environment, in addition to a number of background questions. As this questionnaire was designed for assessing presence in immersive virtual environments, it contained a variety of questions related to dimensions such as engagement or negative effects, both of which are not applicable in non-immersive desktop VR applications. Thus, a subset of 8 items was used for the

current study. These items were measured on a 5-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

6.6.3.2. Cognitive Reactions

Cognitive reactions to the virtual product representation were measured in terms of the subjects' beliefs and belief strengths.

Beliefs about an object and the strength of the beliefs can influence a person's attitudes, as suggested by Ajzen and Fishbein (1980). According to Fishbein and Ajzen (1975), beliefs can be defined as the "subjective probability of a relation between [an] object of the belief and some other object, value, concept, or attribute" (p. 131). In terms of attitude formation, a person's salient beliefs, i.e., the beliefs that are attended to at a given point in time, are most important in attitude formation (Ajzen & Fishbein, 1980).

Based on Nicholson (2005), salient beliefs were operationalized as ease of use, shape-size, and quality beliefs. Five Likert-type items adapted from Davis (1989) were used to measure ease of use. These items were measured on a 7-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

Beliefs about a product's shape and size were assessed using 3 items developed by Nicholson (2005). As with ease of use, the items were measured on a 7-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

Finally, quality beliefs were measured using an adapted form of Dodds, Monroe, and Grewal's (1991) questionnaire (Nicholson, 2005), consisting of 5 Likert-type items

measured on a 7-point scale anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree*.

Relevant to the hypotheses, in addition to measuring the respondents' beliefs, cognitive reactions were assessed in terms of belief strength. As suggested by Ajzen and Fishbein (1980), the strength of each salient belief was measured by asking the respondent how certain they were. The belief strength items used 7-point Likert-type scales anchored at *very certain* and *not at all certain*.

6.6.3.3. Affective Reactions

Affective reactions were measured based on Mehrabian's (1974) emotional response scales. Of the three dimensions pleasure, arousal, and dominance, Havlena and Holbrook (1986) and Mano and Oliver (1993) have shown arousal and pleasure to be the most important affective dimensions in the context of consumer behavior.

Pleasure and arousal were measured using 6 semantic differential scales for each dimension. Each attribute pair was separated by nine response options (Mehrabian, 1995).

6.6.3.4. Attitudes

Following Fishbein and Ajzen (1975), attitude is defined as the degree of favorableness or unfavorableness toward a concept. Attitudes toward the product were measured using a scale adopted from Kempf and Smith (1998). This 3-item semantic differential scale is anchored at *bad/good*, *dislike/like*, and *unfavorable/favorable* (see also MacKenzie & Lutz, 1989; Smith, 1993). Each item was measured on a 7-point scale.

6.6.3.5. Intentions

Intentions, as defined by Fishbein and Ajzen (1975), refer to a "person's subjective probability that he will perform the behavior in question". In the case of the current study, purchase intentions were measured using Coyle and Thorson's (2001) measure of purchase intentions. Coyle and Thorson's measure consists of three 7-point Likert-type items anchored at *strongly agree*, *neither agree nor disagree*, and *strongly disagree,* and one Likert-type item anchored at *definitely would* and *definitely would not*.

6.7. Results

The following sections highlight the data analysis and results. First, a brief overview of the respondents will be provided, followed by a description of missing data handling, and the results of the manipulation checks. Then, the results of the hypothesis testing will be presented.

6.7.1. Subjects

For Study 1, data was collected during a two-week period in Spring 2007. A total of 253 subjects participated in the experiment. The study was conducted in 10 separate sessions with 5 to 31 subjects participating in each session, with random assignment of treatments to sessions. Thus, subjects were assigned to the four conditions as follows: *interactive/ utilitarian* (n=64), *static/utilitarian* (n=63), *interactive/hedonic* (n=63), and *static/ hedonic* (n=63).

After collection of the experimental data, the data were examined for outliers and missing values. One subject in the *static/hedonic* condition was dropped due to an

extreme response pattern (93% of all Likert-type items were responded to with the leftmost option), leaving a final usable sample size of 252. Of these, 150 (59.5%) were male, and 102 (40.5%) were female; the average age was 20.45 years (ranging from 18-34).

6.7.2. Missing Data

For each treatment group, the pattern of missing values was examined using SPSS 15.0. In each case, Little's MCAR test (Little, 1988) was nonsignificant, suggesting that missing data was missing completely at random; in other words, missing data was randomly distributed among cases. Table 3 presents the patterns of missing values. To maximize *N*, it was decided to impute missing values using the Expectancy-Maximization approach in SPSS 15.0.

Table 3 - Missing Values Patterns (Study 1)

Interactivity	Positioning	Total number of cases	Number of complete cases	Number of cases with missing values	Distinct patterns
Interactive	Hedonic	63	43	20	20
	Utilitarian	64	52	12	12
Static	Hedonic	62	44	18	18
	Utilitarian	63	49	14	12

6.7.3. Manipulation Checks

Following the missing data imputation, ANOVAs were conducted to test the efficacy of the experimental manipulations. The analysis revealed that the interactivity manipulation was successful, in that subjects in the *interactive* conditions perceived the

interface as significantly more interactive than subjects in the *static* conditions ($F(1,250) = 4.358$; $p < .05$).

The manipulation check for product positioning indicated that the manipulation was not as strong as expected. Although the means pointed in the right direction, in that the subjects in the *utilitarian* condition regarded the product as more utilitarian than subjects in the *hedonic* condition, the results were nonsignificant ($F(1,250) = 1.422$, *n.s.*). Thus, the following analysis only focuses on the effects of interactivity on presence, as well as on the effects of presence on affective and cognitive reactions.

6.7.4. Analysis of Measurement Model

Before testing the structural model, the data was subjected to a confirmatory factor analysis, following Anderson and Gerbing's (1988) recommended two-step approach. Although the use of the two-step approach is debated (Anderson & Gerbing, 1992; Bentler, 2000; Bollen, 2000; Fornell & Yi, 1992a; 1992b; Hayduk & Glaser, 2000a; 2000b; McDonald & Ho, 2002; Mulaik & Millsap, 2000; Tomarken & Waller, 2003), the use of a confirmatory factor analysis to test the measurement model can help to assess the unidimensionality of the scales used (Gerbing & Anderson, 1988; see also Voss et al., 2003). The sample covariance matrix is presented in Appendix C.

Results of the confirmatory factor analysis showed reasonable model fit, Satorra-Bentler χ^2=1368.880 ($df = 926$; $p < .001$); $\chi^2/df = 1.478$; CFI (robust) = .929; SRMR = .063; RMSEA (robust) = .044 (.039 – .048). While the significant χ^2 signals moderate fit at best, CFI, SRMR, and RMSEA are well within the acceptable ranges. Although the fit indexes

suggest that model fit could be improved, it was decided to refrain from model modification for four reasons. First, modifying the model would bring the researcher back to the exploratory phase (Fornell & Yi, 1992b). Thus additional cross-validation would be needed. Second, there is an inherent tradeoff between the number of indicators used and model fit, such that a high number of indicators (as is the case in this study) will necessarily be detrimental to model fit (Marsh et al., 2004). Third, the different measures were adopted from a variety of contexts. Fourth, as indicated by Straub et al. (2004), studies in information systems seldom show excellent model fit.

Table 4 displays the relationships between the latent variables and their indicators. As suggested by McDonald and Ho (2002), little is gained by displaying the relationships between the latent variables in the measurement model. Thus, these are not reported.

Table 4 – Loadings and Standard Errors (Study 1)

Latent Variable	Indicator	Estimate	S.E.	Critical Ratio	*p*	Squared Corr.
Interactivity	inter1	1				.596
	inter2	0.828	0.079	10.508	***	.504
	inter3	0.867	0.077	11.315	***	.597
	inter4	0.594	0.056	10.543	***	.507
Presence	pres13	1				.641
	pres11	1.071	0.078	13.806	***	.614
	pres10	0.991	0.070	14.261	***	.645
	pres9	1.036	0.069	14.911	***	.689
	pres14	1.032	0.078	13.207	***	.574
	pres15	0.976	0.073	13.378	***	.585
	pres18	0.933	0.078	11.903	***	.487
	pres25	0.897	0.069	12.969	***	.558
EOU	eou_t6	1				.750
	eou_t5	0.961	0.051	18.981	***	.758
	eou_t4	0.934	0.051	18.152	***	.724
	eou_t3	1.005	0.048	20.802	***	.829
	eou_t2	0.978	0.050	19.437	***	.776
	eou_t1	1.023	0.052	19.582	***	.782

Latent Variable	Indicator	Estimate	S.E.	Critical Ratio	*p*	Squared Corr.
Qual	qual_t5	1				.343
	qual_t4	1.098	0.116	9.478	***	.571
	qual_t3	1.451	0.133	10.889	***	.920
	qual_t2	1.406	0.132	10.687	***	.850
	qual_t1	1.330	0.130	10.254	***	.735
Shape	shape_t3	1				.796
	shape_t2	1.036	.057	18.067	***	.870
	shape_t1	.727	.076	9.618	***	.315
Pleasure	feel1	1				.710
	feel2	1.195	.069	17.364	***	.763
	feel3	1.054	.062	16.989	***	.742
	feel4	.789	.063	12.460	***	.488
	feel5	.752	.064	11.691	***	.444
	feel6	.864	.079	10.967	***	.403
Arousal	feel7	1				.199
	feel8	1.476	.228	6.470	***	.463
	feel9	1.265	.185	6.830	***	.624
	feel10	1.255	.185	6.793	***	.603
	feel11	1.415	.218	6.479	***	.466
	feel12	1.528	.225	6.789	***	.601
Attitudes	attgp1	1				.805
	attgp2	1.031	.047	21.716	***	.812
	attgp3	1.018	.043	23.624	***	.882
Int_Purchase	intp1	1				.612
	intp2	1.083	.072	15.071	***	.776
	intp3	1.037	.072	14.397	***	.714
	intp4	.820	.063	13.054	***	.607
Affective reactions (second order)	Pleasure	1				1.000
	Arousal	.424	.073	5.838	***	.355
Cognitive reactions (second order)	EOU	1				.428
	Qual	.870	.132	6.602	***	.542
	Shape	1.197	.155	7.704	***	.531

*** $p < .001$

As suggested by Straub et al. (2004), convergent validity was assessed by analyzing significance of the factor loadings (i.e., the ratio of individual factor loadings to their associated standard errors). *t* values exceeding |2.00| are considered statistically significant at $p <. 05$ (Anderson & Gerbing, 1988; Segars, 1997). As shown in Table 4,

all factor loadings were significant. Further, the item's reliabilities were assessed using the items' squared standardized loadings (i.e., squared multiple correlations). Values exceeding .50 indicate that more of the variance is explained by the factor than by error term (Segars, 1997). While the squared correlations were far below the cutoff value for 5 of the 45 indicators, they approached or exceeded .50 for the remaining indicators (see Table 4). Nevertheless, in the current model, all factor loadings were significant. Composite reliabilities for the latent variables ranged from .83 to .95; average variance extracted ranged from .49 to .83 (see Table 5).

Table 5 - Reliabilities

Construct	Average Variance Extracted	Composite Reliability	Cronbach's Alpha
Interactivity	.55	.83	.823
Presence	.60	.92	.922
EOU	.77	.95	.952
Qual	.68	.91	.905
Shape	.66	.85	.817
Pleasure	.59	.90	.889
Arousal	.49	.85	.836
Attitudes	.83	.93	.936
Intentions to Purchase	.68	.89	.889

Discriminant validity was assessed following Anderson and Gerbing's (1988) approach. Using this approach, for each two constructs, the correlation is constrained to unity, and a χ^2 difference test is performed using the values for the constrained and the unconstrained model. A significant χ^2 difference indicates a correlation of less than unity, indicating that discriminant validity is achieved. This was conducted for all latent variable pairs, resulting in 15 separate χ^2 difference tests. The difference was significant for all variable pairs except for the relationships between interactivity and intention to

purchase and affective responses and intention to purchase (see Table 6). However, these latent variable pairs are conceptually distinct and share no common indicators. Further, the confidence interval around the correlation estimates between the factors did not include 1.0, indicating discriminant validity (see Anderson & Gerbing, 1988). Finally, Cronbach's alphas ranged from .81 to .95, demonstrating overall good internal consistency (see Table 5); for Shape, the item shape_t1 contributed to a low Cronbach alpha.

Table 6 - Discriminant Validity Results

	df	χ^2	χ^2 **difference**	***p***
Default model	926	1655.192		
Constrained path:				
Interactivity - Presence	927	1672.727	17.535	***
Interactivity - Affective Reactions	927	1659.475	4.238	**
Interactivity - Cognitive Reactions	927	1664.397	9.205	**
Interactivity - Intentions to Purchase	927	1656.055	.863	.353
Interactivity - Attitudes	927	1667.959	12.767	***
Presence - Affective Reactions	927	1670.850	15.658	***
Presence - Cognitive Reactions	927	1665.286	10.094	***
Presence - Intentions to Purchase	927	1684.923	29.731	***
Presence - Attitudes	927	1716.110	60.918	***
Affective Reactions - Cognitive Reactions	927	1682.371	27.179	***
Affective Reactions - Intentions to Purchase	927	1655.517	.325	.569
Affective Reactions - Attitudes	927	1668.204	13.012	***
Cognitive Reactions - Intentions to Purchase	927	1701.681	46.489	***
Cognitive Reactions - Attitudes	927	1695.856	40.664	***
Intentions to Purchase - Attitudes	927	1660.581	5.389	**

** $p < .05$; *** $p < .001$

6.7.5. Hypothesis Testing

Following the testing of the measurement model, a structural model containing the hypothesized paths was created. The use of a structural regression model allows to test all hypothesized paths in a single model. The model showed acceptable fit, Satorra-Bentler $\chi^2 = 1409.472$ ($df = 934$; $p < .001$); $\chi^2/df = 1.51$; CFI (robust) = .924; SRMR = .082; RMSEA (robust) = .045 (.040 – .050). While the significant χ^2 signals moderate fit at best, CFI, SRMR, and RMSEA are within the acceptable ranges. As expected, the coefficients related to H1, H2(a,b,c), H4(a,b), and H5 were significant, supporting the hypotheses (see Figure 3). As the manipulation check revealed that the product positioning manipulation was unsuccessful, H3a and H3b were not tested in this study. Table 7 presents a summary of the findings. The next section will take a closer look at the different direct and indirect effects of presence on attitudes and intentions to answer research question 1, "What are the effects of technology characteristics on a consumer's sense of presence, affective reactions, cognitive reactions, attitudes, and intentions?"

The parameter estimates of the structural regression model suggest that both affective and cognitive responses mediate the effect of presence on attitudes. As illustrated by MacKinnon et al. (2002) and suggested by Holbert and Stephenson (2003), mediation in SEM can be tested by testing the significance of specific direct effects. Using the product of two coefficients' *z*-scores, a specific indirect effect can be tested by comparing the *z*-score with the distribution of two random, normal variables (Craig,

1936; Springer & Thompson, 1966). Using this approach, a *z*-score larger than 2.18 is needed for the effect to be significant at .05 (MacKinnon et al., 2002).

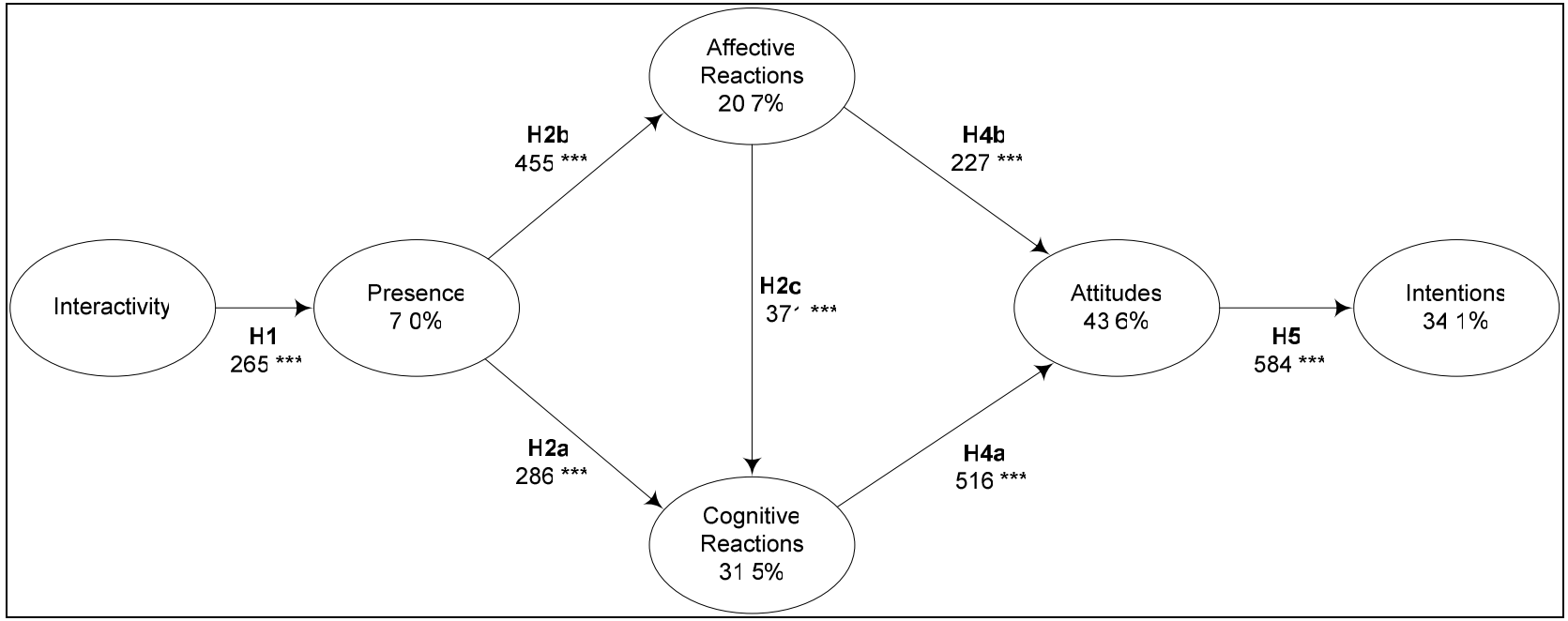
Table 7 - Summary of Results (Study 1)

	Hypothesis	***p***	**Supported?**
H1	Increased interactivity will lead to increased presence perceptions.	***	✓
H2a	Increased presence will positively influence cognitive reactions.	***	✓
H2b	Increased presence will positively influence affective reactions.	***	✓
H2c	Affective reactions will positively influence cognitive reactions.	***	✓
H3a	Products positioned in a hedonic way will elicit stronger affective reactions than products positioned in a utilitarian way.	--	*not tested*
H3b	Products positioned in a utilitarian way will elicit stronger cognitive reactions than products positioned in a hedonic way.	--	*not tested*
H4a	Cognitive reactions will positively influence attitudes toward a product.	***	✓
H4b	Affective reactions will positively influence attitudes toward a product.	***	✓
H5	Attitudes toward a product will positively influence purchase intentions.	***	✓

*** $p < .001$

This analysis showed that the path from Presence via Affective Reactions to Attitudes ($z = 21.33$) and the path from Presence via Cognitive Reactions to Attitudes ($z = 19.96$) were both significant. This supports the importance of including affective reactions as a mediating variable in the relationship between presence and attitudes.

Figure 3 - Structural Model (Study 1)



Note: *** $p < .001$; H3a and H3b were not tested in this study.

Fit: Satorra-Bentler $\chi 2 = 1409.472$ ($df = 934$; $p < .001$); $\chi 2/df = 1.51$; CFI (robust) = .924; SRMR = .082; RMSEA (robust) = .045 (.040 – .050)

Finally, the effects of the control variables on presence were tested. Specifically, a structural regression model including the effects of interactivity, product class knowledge, virtual reality knowledge, gender, need for tactile input, style of processing, product involvement, and computer playfulness was created and tested. While the model demonstrated at best marginal fit, Satorra-Bentler χ^2=1854.235 (df = 1099; $p < .001$); χ^2/df = 1.687; CFI (robust) = .874; SRMR = .065; RMSEA (robust) = .052 (.048 – .056), the analysis showed that only involvement and computer playfulness emerged as statistically significant factors contributing to presence. All other suggested control variables did not significantly influence presence.

The preceding sections have discussed the data analysis strategies, the testing of the measurement model and the structural model, as well as the results of the hypothesis checks. These results will be discussed in the following section.

6.8.Discussion

6.8.1. Interactivity

Interactivity was defined as the user's ability to visually and functionally control a virtually represented product (Jiang & Benbasat, 2004-2005). In Study 1, interactivity was operationalized as having two discrete levels, one level providing low visual and functional control, and one level providing high visual and functional control. The results of the study show that interactivity influences presence, such that higher interactivity contributes to higher presence ($p < .001$). However, the path coefficient of .264 is rather small, suggesting that the interactivity manipulation was not as strong as expected. Three

primary reasons may account for this weak effect of interactivity on presence. First, the interfaces may have not been perceived as very different. For example, the mere ability to switch between different pages (i.e., one page for product features and one page for product views) may have been regarded as rather interactive, thus, raising perceptions of interactivity in both conditions. Second, the manipulation of functional control may not have been strong enough; in order to minimize potential confounding differences between the interfaces, care was taken to maximize similarity. The use of a scrollbar vs. the use of the mouse to virtually click a menu item may not have been sufficiently different in terms of interactivity to create larger effects. Finally, the goal-directed task may have masked differences in interactivity. As the subjects were asked to answer a series of specific questions about the product, the focus of their attention may have been directed away from the interface, toward the features of the product.

The analysis including the potential control variables has shown that product category involvement and computer playfulness significantly influence presence. While Nicholson (2005) has shown a significant effect of involvement on presence, he has not shown a significant effect of computer playfulness. However, Nicholson used a relatively more hedonic task, where subjects were enticed to "play around" with this interface; thus, there may have been a ceiling effect. In contrast, the relatively more utilitarian task used in this study may have prompted the subjects to take a less playful stance overall, so that any differences in playfulness may have been more pronounced. Finally, the very specific, goal-directed task may have masked hypothesized differences in terms of product knowledge, VR knowledge, etc.

6.8.2. Affective Responses

As hypothesized, the results of the analysis show a medium-large effect of presence on affective responses ($p < .001$). Further, the significant z-value of the product of the path coefficients between presence and affective responses and affective responses and attitudes indicates that affective responses (partially) mediate the relationship between presence and attitudes. This, paired with a medium (statistically significant) effect of affective reactions on cognitive reactions shows the value of including affective responses in such model. As VPEs have been characterized as providing a direct-like experience, these findings further corroborate findings in the field of consumer behavior, suggesting the importance of affective responses in direct product experiences (Kempf & Smith, 1998; Klein, 2003).

6.8.3. Cognitive Responses

The analysis of the structural model further shows that presence significantly ($p < .001$) influences consumer's cognitive responses. Further, the results show a significant ($p < .001$) effect of affective responses on cognitive responses.

The small effect of presence on cognitive responses may be attributed to the nature of the task. As the subjects were guided through a series of questions of products, this may have led to an overall increase in belief strength, independent of the effects of presence. In other words, as the subjects were "forced" to analyze the product's features to answer the questions, this may have strengthened the confidence in their product-related beliefs, thus reducing the effects of presence.

6.8.4. Attitudes

Study 1 has shown that both affective and cognitive reactions significantly ($p < .001$) influence an online consumer's attitudes. In addition to the direct effect of .227 of affective reaction on attitudes, affective reactions have an indirect effect (via cognitive reactions) on attitudes of .191, for a total effect of .418. Cognitive reactions have a direct effect of .517 on attitudes. Together, these constructs explain 43.6% in the variance of attitudes toward the product. These findings demonstrate that the consumers' affective responses have a significant effect on consumers' attitudes, over and above the effect of their cognitive reactions.

6.8.5. Intentions

Finally, the results of the analysis showed that, as expected, attitudes had a significant effect on purchase intentions. Specifically, it was hypothesized that consumers' attitudes will positively influence attitudes. The path coefficient supports this hypothesis.

6.8.6. Product Positioning

As indicated by the manipulation check, there was no difference between how the subjects perceived the product in terms of the hedonic/utilitarian dimension. Thus, H3a and H3b could not be tested in the current study. As with the interactivity manipulation, care was taken to keep the conditions very similar to eliminate any confounds; thus, the manipulation was very subtle. Further, the goal-directed task of having to answer a series of multiple choice questions may have directed the subjects' attention away from the

positioning manipulation, towards the product itself. This lessened focus on the positioning manipulation may have contributed to the non-significant effect of positioning.

6.9.Summary

This chapter has presented a detailed description of Study 1, followed by a presentation and discussion of the results. Specifically, Study 1 has supported the hypothesized relationships between presence, affective responses, cognitive responses, attitudes and intentions, demonstrating that interactivity influences presence, which in turn significantly affects cognitive and affective reactions, which influence attitudes and intentions. However, an unsuccessful positioning manipulation has prevented testing hypotheses H3a and H3b. Study 2 has been designed to address this shortcoming; Study 2 will be presented in the next chapter.

7. Study 2

The preceding chapter has presented Study 1, a laboratory experiment designed to test the hypothesized relationships. However, due to some limitations associated with Study 1, a second study was conducted.

Study 2 served three primary purposes. First, Study 2 was designed to address the shortcomings of Study 1, namely, the unsuccessful manipulation of the hedonic/utilitarian product attitudes, and the use of a very goal directed task. Second, Study 2 was designed to test the theory using a different product, namely, a cellular phone, as it was deemed to be more suited for the positioning manipulation. Third, this study was designed to test the theory using a different, more heterogeneous sample.

While Study 2 by and large followed Study 1, there are a variety of differences in the experimental stimuli, the recruiting of the subjects, and the procedures followed. The following section will provide a description of Study 2.

7.1.Design

As Study 1, Study 2 used a 2 × 2 design, manipulating interactivity and product positioning. For Study 2, a new website presenting a cellular phone was created. Given the various uses for a cellular phone (such as for business, emergency, and entertainment) it was believed that the manipulation of product positioning would be more pronounced.

Four different versions of the same web site were designed, differing in interactivity (static versus interactive) and product positioning (hedonic versus utilitarian). The interfaces in the *interactive* condition contained a 3D-representation of the product,

allowing the user to open and close the phone, rotate, pan, zoom, and measure the phone. Thus, features such as panning, zooming, and rotating afforded high visual control, while the ability to open and close the phone afforded functional control. In contrast, in the *static* condition, a series of 10 static pictures was provided. These pictures presented the phone from different angles, both in opened and closed states. As indicated by Lee and Benbasat (2003), image size can influence online shoppers' reactions to the products presented. Thus, care had to be taken to avoid any potential confounding effects, as the *interactive* condition enabled the user to zoom in and out. Following Jiang and Benbasat (2004-2005), a value between the two zooming extremes was chosen for the static pictures. For example, in the *interactive* condition, the closed cell phone measured between 180×75 pixels and 445×180 pixels, whereas in the *static* condition, the image of the closed cell phone was 370×150 pixels.

The product positioning manipulation consisted of text and pictures advertising different uses of the cell phone. In the *hedonic* condition, the text highlighted uses of the cell phone for pleasure; the associated pictures showed young girls talking on a cell phone. Further, the site showed features such as music and entertainment. In contrast, in the *utilitarian* condition, the text was related to the use of cell phones in case of a roadside emergency. The accompanying pictures showed a person changing a tire, and a person on the cell phone next to a car with an open hood. As opposed to the hedonic features music and entertainment, relatively more utilitarian features of connectivity and organizer functionality were presented. Appendix D presents the different interfaces.

Further, in contrast to Study 1, the subjects were not charged with answering specific product-related questions. Rather, the subjects were left to browse at their leisure. Before accessing the page containing the manipulations, the subjects were instructed to imagine that they were thinking about purchasing a cellular phone, and that they should immerse themselves and obtain as much information as possible about the cellular phone presented. While the instructions left it open to the subjects how long they wanted to interact with the site, the scenario was intended to ensure that the subjects spent sufficient time interacting with the virtual product representation.

7.2. Pre-test

A pretest was conducted to test the interface, and provide preliminary results. This pretest was conducted using students from an introductory course in management information systems. The students were instructed to recruit additional subjects to complete the study. For the pretest, a Sony K800i cellular phone was used. However, the hedonic/utilitarian manipulation appeared to be weaker than expected, and the product was perceived as being very utilitarian in both conditions. Thus, it was decided to use a Motorola KRAZR "flip phone" for the final experiment. Further, minor technical issues were fixed based on the feedback gained form the pretest.

7.3. Sample

Students in an introductory distance education course in management information systems were asked to recruit subjects for this experiment in exchange for course credit. The 39 students recruited a total of 202 subjects.

7.4.Procedures

All subjects were free to complete the study at the most convenient time and place during a specified time period. Thus, there was considerable variation in terms of operating systems, web browsers, and screen resolutions. While this may increase error variance, these differences can help to provide a stronger test of the theory.

Upon entering the experimental URL into their browser, the subjects were randomly assigned to one of the four conditions, and were presented with a consent form. Then, the subjects were directed to the instructions, and the experimental web site. As the *interactive* conditions required Java to be installed on the subjects' browsers, subjects without Java were automatically redirected to the *static* condition.

7.5.Experiment

During the experiment, the subjects were free to interact with the virtual product representation at their leisure. Once they were finished interacting with the page, they proceeded to the final survey.

7.6.Measures

The measures used in Study 2 mirrored those used in Study 1. The only exception was the inclusion of an additional set of items to check the efficacy of the positioning manipulation. These items were based on the Hed/Ut scale developed by Voss et al. (2003), but, instead of asking about the product, the question asked how the product was *positioned* on the experimental site. All other independent, control, and dependent variables were retained for Study 2.

7.7.Results

The following sections highlight the data analysis and results. First, a brief overview of the respondents will be provided, followed by a description of missing data handling, and the results of the manipulation checks. Then, the results of the hypothesis testing will be presented.

7.7.1. Subjects

For Study 2, data was collected during a 10-day period in Summer 2007. The subjects were free to participate in the study at their convenience. At the time they started the experiment, they were randomly assigned to one of the four conditions. A total of 202 subjects participated in the experiment.

After the end of the time window given for completing the study, the data were examined for outliers and missing values. One subject indicated technical problems with the interface and was subsequently dropped form the analysis. The final usable sample size was 201. Of these, 108 (53.7%) were female and 93 (46.3%) were male, and the average age was 36 years (ranging from 13-84). The distribution of subjects to the conditions was as follows: *interactive/utilitarian* (n=40), *static/utilitarian* (n=60), *interactive/hedonic* (n=48), and *static/hedonic* (n=53).

7.7.2. Missing Data

For each treatment group, the pattern of missing values was examined using SPSS 15.0. In each case, Little's MCAR test (Little, 1988) was nonsignificant, suggesting that missing data was missing completely at random, in other words, missing data was

randomly distributed among cases. Table 8 presents the patterns of missing values. To keep the *N* as high as possible, it was decided to impute missing values using the Expectancy-Maximization approach in SPSS 15.0.

Table 8 - Missing Values Patterns (Study 2)

Interactivity	Positioning	Total number of cases	Number of complete cases	Number of cases with missing values	Distinct patterns
Interactive	Hedonic	48	31	17	17
	Utilitarian	40	20	20	19
Static	Hedonic	53	28	25	25
	Utilitarian	60	37	23	23

7.7.3. Manipulation Checks

Following the missing data imputation, ANOVAs were conducted to test the efficacy of the experimental manipulations. This analysis revealed that the interactivity manipulation was successful, in that subjects in the high interactivity conditions perceived the interface as significantly more interactive than subjects in the low interactivity conditions ($F(1,199) = 21.971$; $p < .001$).

Further, as expected, the stronger experimental manipulation of product positioning proved successful, as the subjects in the utilitarian condition regarded the product as being *positioned* as more utilitarian than subjects in the hedonic condition ($F(1,199) = 23.381$, $p < .001$). Further, *overall*, the subjects in the utilitarian condition regarded the product as more utilitarian than subjects in the hedonic condition ($F(1,199) = 4.924$, $p < .028$)

7.7.4. Analysis of Measurement Model

As with Study 1, the data was first subjected to a confirmatory factor analysis, following the two step-approach recommended by Anderson and Gerbing (1988). However, the observable variable shape_t1 showed problematic psychometric properties (i.e., contributed to a low Cronbach's alpha) across Study 1 and Study 2, and was thus dropped from the model. Results of the confirmatory factor analysis showed reasonable model fit, Satorra-Bentler $\chi^2 = 1235.539$ ($df = 882$; $p < .001$); $\chi^2/df = 1.40$; CFI (robust) = .941; SRMR = .063; RMSEA (robust) = .045 (.039 – .050). While the significant χ^2 signals moderate fit at best, CFI, SRMR, and RMSEA are well within the acceptable ranges.

Table 9 displays the relationships between the latent variables and their indicators. As suggested by McDonald and Ho (2002), little is gained by displaying the relationships between the latent variables in the measurement model. Thus, these are not reported.

Table 9 – Loadings and Standard Errors (Study 2)

Latent Variable	Indicator	Estimate	S.E.	Critical Ratio	*p*	Squared Corr.
Interactivity	inter1	1				.670
	inter2	1.068	.074	14.507	***	.780
	inter3	.935	.074	12.648	***	.632
	inter4	.858	.064	13.488	***	.695
Presence	pres13	1				.333
	pres11	1.399	.181	7.734	***	.520
	pres10	1.130	.156	7.228	***	.424
	pres9	1.449	.184	7.890	***	.554
	pres14	1.287	.164	7.841	***	.543
	pres15	1.149	.166	6.918	***	.374
	pres18	1.471	.188	7.817	***	.537
	pres25	1.497	.188	7.956	***	.569
EOU	eou_t6	1				.816
	eou_t5	.986	.047	20.964	***	.827
	eou_t4	.903	.049	18.367	***	.744

Latent Variable	Indicator	Estimate	S.E.	Critical Ratio	*p*	Squared Corr.
	eou_t3	.972	.044	22.094	***	.858
	eou_t2	.982	.043	22.628	***	.872
	eou_t1	1.025	.046	22.279	***	.863
Qual	qual_t1	1				.808
	qual_t2	.951	.049	19.427	***	.797
	qual_t3	1.025	.045	22.825	***	.910
	qual_t4	.841	.056	14.974	***	.624
	qual_t5	.528	.064	8.220	***	.280
Shape	shape_t3	1				.815
	shape_t2	.956	.074	12.884	***	.730
Pleasure	feel1	1				.637
	feel2	1.220	.087	14.039	***	.735
	feel3	1.278	.083	15.306	***	.831
	feel4	1.022	.080	12.698	***	.635
	feel5	.890	.075	11.845	***	.572
	feel6	1.282	.099	12.954	***	.654
Arousal	feel7	1				.305
	feel8	1.603	.204	7.875	***	.665
	feel9	1.005	.139	7.207	***	.482
	feel10	1.073	.142	7.557	***	.568
	feel11	1.206	.178	6.791	***	.398
	feel12	1.560	.197	7.906	***	.676
Attitudes	attgp1	1				.737
	attgp2	1.141	.064	17.793	***	.838
	attgp3	1.104	.061	17.975	***	.849
Int_Purchase	intp1	1				.664
	intp2	.933	.068	13.736	***	.721
	intp3	.990	.070	14.068	***	.748
	intp4	.780	.064	12.254	***	.608
Affective reactions (second order)	Pleasure	1				.927
	Arousal	.542	.106	5.095	***	.428
Cognitive reactions (second order)	EOU	1				.464
	Qual	.948	.127	7.448	***	.514
	Shape	1.086	.138	7.850	***	.676

*** $p < .001$

Convergent validity was assessed by analyzing significance of the factor loadings (i.e., the ratio of individual factor loadings to their associated standard errors). As shown in Table 9, all factor loadings were significant. Further, the item's reliabilities were

assessed using the items' squared standardized loadings. Values exceeding .50 indicate that more of the variance is explained by the factor than by error term (Segars, 1997). While the squared correlations were far below the cutoff value for 6 of the 44 indicators, they approached or exceeded .50 for the remaining indicators (see Table 9). Nevertheless, in the current model, all factor loadings were significant. Composite reliabilities for the latent variables ranged from .76 to .97; average variance extracted ranged from .46 to .83 (see Table 10).

Table 10 - Reliabilities (Study 2)

Construct	Average Variance Extracted	Composite Reliability	Cronbach's Alpha
Interactivity	.77	.92	.90
Presence	.60	.91	.88
EOU	.83	.97	.97
Qual	.80	.94	.91
Shape	.50	.76	.87
Pleasure	.54	.90	.92
Arousal	.48	.85	.86
Attitudes	.46	.82	.93
Intentions to Purchase	.72	.91	.90

As in Study 1, discriminant validity was assessed performing χ^2 difference test between correlations between constructs constrained to unity and the unconstrained model. A significant χ^2 difference indicates a correlation of less than unity, indicating that discriminant validity was achieved. This was conducted for all latent variable pairs, resulting in 15 separate χ^2 difference tests. The difference was significant for all variable pairs except for the relationships between interactivity and intention to purchase, affective responses and intention to purchase, attitudes and intention to purchase, and interactivity and affective responses (see Table 11). However, these latent variable pairs

are conceptually distinct and share no common indicators. Further, the confidence interval around the correlation estimates between the factors did not include 1.0, indicating discriminant validity. Finally, Cronbach's alphas ranged from .86 to .97, demonstrating overall good internal consistency (see Table 10).

Table 11 - Discriminant Validity Results (Study 2)

	df	χ^2	χ^2 difference	*p*
Default model	882	1447.956		
Constrained path:				
Interactivity - Presence	883	1463.468	15.512	***
Interactivity - Affective Reactions	883	1450.503	2.547	.111
Interactivity - Cognitive Reactions	883	1462.447	14.491	***
Interactivity - Intentions to Purchase	883	1448.2	.244	.621
Interactivity - Attitudes	883	1459.318	11.362	***
Presence - Affective Reactions	883	1470.008	22.052	***
Presence - Cognitive Reactions	883	1453.375	5.419	**
Presence - Intentions to Purchase	883	1473.418	25.462	***
Presence - Attitudes	883	1504.382	56.426	***
Affective Reactions - Cognitive Reactions	883	1465.587	17.631	***
Affective Reactions - Intentions to Purchase	883	1447.957	.001	.975
Affective Reactions - Attitudes	883	1456.234	8.278	***
Cognitive Reactions - Intentions to Purchase	883	1472.804	24.848	***
Cognitive Reactions - Attitudes	883	1503.308	55.352	***
Intentions to Purchase - Attitudes	883	1448.441	.485	.486

** $p < .05$; *** $p < .001$

7.7.5. Hypothesis Testing

Following the testing of the measurement model, a structural model containing the hypothesized paths was created. As suggested by Bentler (2004) and Kline (2005), product positioning was included in the model as a dummy coded variable (utilitarian = 0; hedonic = 1), predicting both cognitive and affective responses. The model showed acceptable fit, Satorra-Bentler $\chi^2 = 1313.50$ ($df = 933$; $p < .001$); $\chi^2/df = 1.41$; CFI(robust)

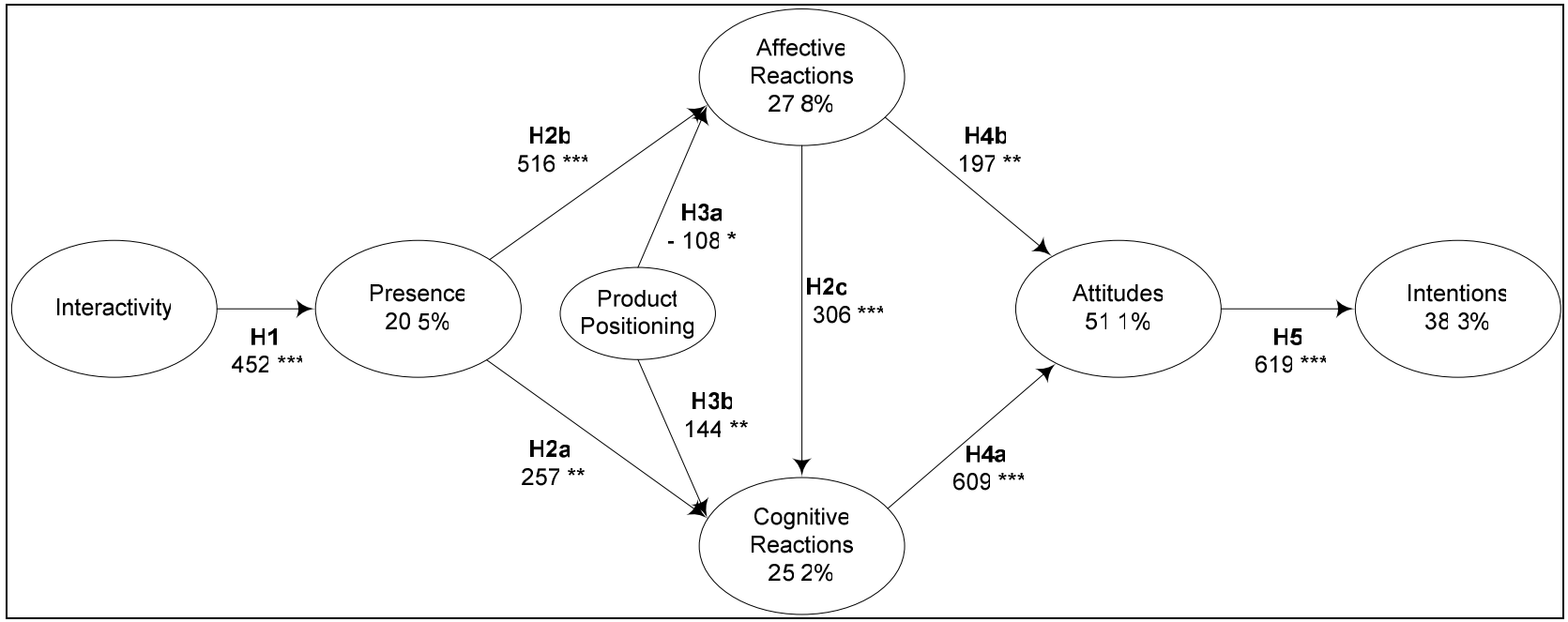
= .936; SRMR = .082; RMSEA = .045 (.039 – .051). As expected, the coefficients related to H1, H2(a,b,c), H4(a,b), and H5 were significant, supporting the hypotheses (see Figure 4). Furthermore, product positioning influenced affective and cognitive reactions. However, while the effect of product positioning on cognitive reactions was significant, the effect of product positioning on affective reactions fell short of the .05 significance criterion ($p < .10$). Moreover, interestingly, the effect of positioning on cognitive reactions was positive, whereas the effect of product positioning on affective reactions was negative, contradicting hypotheses H3a and H3b. The implications of this finding will be discussed below. Table 12 presents a summary of the findings.

Table 12 - Summary of Results (Study 2)

	Hypothesis	***p***	**Supported?**
H1	Increased interactivity will lead to increased presence perceptions.	***	✓
H2a	Increased presence will positively influence cognitive reactions.	**	✓
H2b	Increased presence will positively influence affective reactions.	***	✓
H2c	Affective reactions will positively influence cognitive reactions.	***	✓
H3a	Products positioned in a hedonic way will elicit stronger affective reactions than products positioned in a utilitarian way.	*	✗
H3b	Products positioned in a utilitarian way will elicit stronger cognitive reactions than products positioned in a hedonic way.	**	✗
H4a	Cognitive reactions will positively influence attitudes toward a product.	***	✓
H4b	Affective reactions will positively influence attitudes toward a product.	***	✓
H5	Attitudes toward a product will positively influence purchase intentions.	***	✓

* $p < .10$; ** $p < .05$; *** $p < .001$

Figure 4 - Structural Model (Study 2)



Note: * $p < .10$; ** $p < .05$; *** $p < .001$

Fit: Satorra-Bentler $\chi 2 = 1313.50$ ($df = 933$; $p < .001$); $\chi 2/df = 1.41$; CFI (robust) = .936; SRMR = .082; RMSEA (robust) = .045 (.039 – .051)

As in Study 1, the parameter estimates of the structural regression model suggest that both affective and cognitive responses mediate the effect of presence on attitudes. Mediation analysis following MacKinnon et al.'s (2002) approach showed that the path from Presence via Affective Reactions to Attitudes and the path from Presence to Cognitive Reactions to Attitudes were significant. Again, this supports the importance of including affective reactions as a mediating variable in the relationship between presence and attitudes.

The preceding sections have discussed the data analysis strategies, the testing of the measurement model and the structural model, as well as the results of the hypothesis testing. The following section will provide a discussion of the results of Study 2.

7.8.Discussion

The results of Study 2 closely mirror those of Study 1. Specifically, Study 2 confirmed the relationships hypothesized and tested in Study 1. In contrast to Study 1, Study 2 used a different subject pool as well as a different product, which further lends confidence in the results. Further, Study 2 employed a stronger product positioning manipulation, such that the product presented was perceived as more hedonic or utilitarian by the subjects, depending on how it was presented. The following section will discuss the findings related to product positioning.

7.8.1. Product Positioning

The manipulation check showed that in the hedonic positioning conditions, subjects perceived the product as relatively more hedonic, whereas in the utilitarian

positioning condition, subjects perceived the product as being relatively more utilitarian. Thus, the effects of product positioning on affective and cognitive reactions could be tested.

Specifically, hypothesis H3a argued that products positioned in a hedonic way will elicit stronger affective reactions than products positioned in a utilitarian way. Analogously, H3b argued that products positioned in a utilitarian way will elicit stronger cognitive reactions than products positioned in a hedonic way. These hypotheses were tested within the structural model. The results indicate that product positioning influences both affective and cognitive reactions. While the effect of positioning on cognitive reactions was statistically significant, the effect of positioning on affective reactions fell short of the .05 significance criterion.

An examination of the path coefficients revealed that, in contrast to the hypothesis, products positioned in a hedonic way elicited stronger cognitive reactions than products positioned in a utilitarian way, whereas the effect on affective reactions was in the opposite direction. While this seems at first counterintuitive, the effects of positioning on cognitive reactions may be explained by the measures used to elicit cognitive reactions. Specifically, cognitive reactions consisted of the first-order factors ease-of-use, shape-size beliefs, and quality beliefs. Both ease-of-use and shape-size beliefs are to some extent targeted at the experiential aspects of the product. The positioning manipulation was implemented using text focusing on enjoyment and pictures of young people using a cell phone. This may have triggered stronger beliefs about the shape and size, and to some extent, the ease of use of the product in the hedonic conditions. In regards to the

negative effect on affective reactions, this may be due to an effect of arousal, in that the implementation of the utilitarian positioning (pictures and text about a roadside emergency) may have contributed to higher arousal in the utilitarian condition. Further, the stimuli in the hedonic condition emphasized activities for young people and displayed college-age women. This may not have had the intended effects on the very heterogeneous sample.

7.9. Summary

This chapter has provided a description of Study 2. Study 2 was designed to address the shortcomings of Study 1, namely, limitations associated with the use of student subjects, the use of a single product, and the issues surrounding the product positioning manipulation. Overall, Study 2 has achieved these goals partially, by supporting the findings of Study 1. However, Study 2 also showed some interesting results related to the effects of product positioning. The next chapter will provide a general discussion of the findings, as well as a discussion of limitations of the current study, and suggest avenues for future research.

8. General Discussion, Limitations, and Conclusions

This dissertation focused on the role of interactivity and product positioning on consumer reactions in online settings. Specifically, it was argued that interactivity (as a technology characteristic) would influence presence, which in turn would influence affective and cognitive reactions. Further, product positioning by way of the human-computer interface was hypothesized to influence affective and cognitive reactions, which, in turn, would influence attitudes and intentions.

This dissertation has provided support for the hypothesized relationships using two different products, and two very different samples. First, a laboratory experiment was conducted to test the hypothesized effects, followed by a field experiment using non-student subjects. In contrast to the controlled laboratory experiment in Study 1, subjects in Study 2 could complete the experiment at their leisure. Therefore, students used a variety of different computers with different operating systems, web browsers, Internet connections, and screen resolutions. These factors are likely to have contributed to variance in the subjects' responses. Nevertheless, the results have shown that the hypothesized relationships were supported, mirroring the results of Study 1. Further, Study 2 employed a different product positioning manipulation, which allowed testing the hypothesized relationships related to product positioning. Interestingly, a simple manipulation of the way the product was presented influenced the subjects' affective and cognitive reactions, albeit in unexpected ways.

8.1. Limitations

Clearly, no study is without limitations (Dennis & Valacich, 2001). Two studies have been conducted in order to address shortcomings of each individual study. For example, a field experiment was employed to address shortcomings associated with the laboratory experiment conducted in Study 1. Nevertheless, the current studies suffer from several shortcomings. First of all, the use of a variety of different measurement instruments is likely to have contributed to a less than perfect fit of the models presented. Nevertheless, the models have been shown to hold across different settings, products, and subjects. Further, as Study 1 had several problems, Study 2 has employed a variety of different techniques to address these problems. Among the ways to address the problems are the use of a different sample, a different product, a different product positioning manipulation, and a different task. Thus, future research should individually test the different factors in order to further tease out in how far task, positioning, or product type influence consumer reactions. Finally, both studies have used products from the category consumer electronics. Specifically, a digital camera and a cell phone have been used, as cameras had been successfully employed in prior studies, and both products offer a variety of affordances that can be represented virtually. However, different products may *a priori* be considered relatively more hedonic (e.g., an Apple iPod) or relatively more utilitarian (e.g., a scanner or an inkjet printer). While it stands to reason that there would be a differential effect on affective and cognitive reactions, future research should test in how far product positioning manipulations can be applied to products located on the extremes.

In relationship to the unexpected findings of Study 2, a limitation might have been the way cognitive structure was measured. While the Study has used measures adapted from prior studies, these measures may have confounded the results, as for example shape (and to some extent ease of use) are related to the experiential aspects of a product; thus, it appears logical that these may contribute to the effect on cognitive reactions for hedonic products.

8.2. Conclusion

The goal of this dissertation was to test how modifications of the human-computer interface influence consumer reactions. This dissertation has accomplished this goal by demonstrating how technological characteristics (i.e., interactivity) can influence a consumer's sense of presence, which in turn influences affective and cognitive reactions, as well as attitudes and intentions. Further, this dissertation has helped to further bridge the research in online and offline shopping by demonstrating the differential effects of simulated direct experiences on affective and cognitive reactions, depending on product type.

For practice, this dissertation has provided a means by which designers of online shopping environments can decide how to best represent their products. Based on the consumer's and the marketer's goal, products can easily be presented as relatively more hedonic or utilitarian, using simple manipulations of the human-computer interface. The way the product is presented then influences the consumer's affective and cognitive reactions. Specifically, products positioned as very hedonic elicit stronger cognitive reactions. However, the unexpected effect on affective reactions indicates that positioning

strategies may “backfire” if they are not closely aligned with the intended target market. For example, positioning strategies aimed at eliciting positive affective reactions in younger generations may be counterproductive for other consumers.

While answering several important questions, this research has also opened up avenues for future research. First of all, future research should revisit the effects of positioning on cognition and affect, using different ways (e.g., qualitative) to measure these constructs. Further, future research could focus on the consumer’s task. It is very likely that congruency between the consumer’s task and the way products are presented and positioned will influence consumer reactions.

9. References

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.

Anderson, J. C., & Gerbing, D. W. (1992). Assumptions and comparative strengths of the two-step approach: Comment on Fornell and Yi. *Sociological Methods & Research,* 20(3), 321-333.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin,* 103(3), 411-423.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science,* 16(1), 74-94.

Barfield, W., & Hendrix, C. (1995). The effect of update rate on the sense of presence within virtual environments. *Virtual Reality: Research, development, and application,* 1(1), 3-15.

Batra, R., & Ahtola, O. T. (1990). Measuring the hedonic and utilitarian sources of consumer attitudes. *Marketing Letters,* 2(2), 159-170.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin,* 107(2), 238-246.

Bentler, P. M. (2004). *EQS 6 Structural equations program manual*. Encino, CA: Multivariate Software.

Bentler, P. M. (2000). Rites, wrongs, and gold in model testing. *Structural Equation Modeling,* 7(1), 82-91.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin,* 88(3), 583-606.

Bezjian-Avery, A., Calder, B., & Iacobucci, D. (1998). New media interactive advertising vs. traditional advertising. *Journal of Advertising Research,* 38(4), 23-32.

Biocca, F. (1997). The cyborg's dilemma: progressive embodiment in virtual environments. *Journal of Computer-Mediated Communication,* 3(2)

Biocca, F. (1992). Virtual reality technology: a tutorial. *Journal of Communication,* 42(4), 23-72.

Biocca, F., & Delaney, B. (1995). Immersive virtual reality technology. In F. Biocca & M.

Levy (Eds.), *Communication in the age of virtual reality* (pp. 57-124). Mahwah, NJ: Lawrence Erlbaum.

Biocca, F., & Levy, M. R. (1995). *Communication in the age of virtual reality*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Bollen, K. A. (2000). Modeling strategies: in search of the holy grail. *Structural Equation Modeling,* 7 (1), 74-81.

Breckler, S. J., & Wiggins, E. (1989). Affect versus evaluation in the structure of attitude. *Journal of Experimental Social Psychology,* 25(253-271)

Burke, M. C., & Edell, J. A. (1989). The impact of feelings on ad-based affect and cognition. *Journal of Marketing Research,* 26(1), 69-83.

Byrne, B. M. (2001). *Structural equation modeling with AMOS: basic concepts, applications, and programming*. Mahwah, NJ: Lawrence Erlbaum Associates.

Calder, B. J., Phillips, L. W., & Tybout, A. M. (1982). The concept of external validity. *Journal of Consumer Research,* 9(December), 240-244.

Calder, B. J., & Tybout, A. M. (1999). A vision of theory, research, and the future of business schools. *Journal of the Academy of Marketing Science,* 27(3), 359-366.

Childers, T. L., Houston, M. J., & Heckler, S. E. (1985). Measurement of individual differences in visual versus verbal information processing. *Journal of Consumer Research,* 12(2), 125-134.

Chung, H., & Zhao, X. (2004). Effects of perceived interactivity on web site preference and memory: role of personal motivation. *Journal of Computer Mediated Communication,* 10(1, Article 7)

Citrin, A. V., Stem, D. E., Spangenberg, E. E., & Clark, M. J. (2003). Consumer need for tactile input: An Internet retailing challenge. *Journal of Business Research,* 56(11), 915-922.

Cohen, J. B., Pham, M. T., & Andrade, E. B. (2007). The nature and role of affect in consumer behavior. Forthcoming in C. P. Haugtvedt, P. Herr, & F. Kardes (Eds.), *Handbook of consumer psychology* Mahwah, NJ: Lawrence Erlbaum.

Coyle, J. R., & Thorson, E. (2001). The effects of progressive levels of interactivity and vividness in web marketing sites. *Journal of Advertising,* 30(3), 65-77.

Craig, C. C. (1936). On the frequency function of xy. *The Annals of Mathematical Statistics,* 7(1), 1-15.

Crites, S. L., Fabrigar, L. R., & Petty, R. E. (1994). Measuring the affective and cognitive properties of attitudes: Conceptual and methodological issues. *Personality and Social Psychology Bulletin,* 20(6), 619-634.

Crowley, A. E., Spangenberg, E. R., & Hughes, K. R. (1992). Measuring the hedonic and utilitarian dimensions of attitudes toward product categories. *Marketing Letters ,* 3(3), 239-249.

Da Bormida, G., & Lefrere, P. (2003). User presence in mobile environments. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 183-190). Amsterdam: IOS Press.

Daft, R. L., Lengel, R. H., & Trevino, L. K. (1987). Message equivocality, media selection, and manager performance: implications for information systems. *Management Information Systems Quarterly,* 11, 355-366.

Daft, R. L., & Lewin, A. Y. (1993). Where are the theories for the "new" organizational forms? An editorial essay. *Organization Science,* 4(4), i-vi.

Darby, M. L., & Karni, E. (1973). Free competition and the optimal amount of fraud. *Journal of Law and Economics,* 16(1), 67-88.

Davide, F., & Walker, R. (2003). Engineering presence: an experimental strategy. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 41-57). Amsterdam: IOS Press.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly,* 13(3), 319-340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology - a comparison of two theoretical models. *Management Science,* 35(8), 982-1003.

Dennis, A. R., & Kinney, S. T. (1998). Testing media richness theory in the new media: the effects of cues, feedback, and task equivocality. *Information Systems Research,* 9(3), 256-274.

Dennis, A. R., & Valacich, J. S. (2001). Conducting research in information systems. *Communications of the AIS,* 7(Article 5)

Dhar, R., & Wertenbroch, K. (2000). Consumer choice between hedonic and utilitarian goods. *Journal of Marketing Research,* 37(February), 60-71.

Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of price, brand, and store

information on buyer's product evaluations. *Journal of Marketing Research,* 28(3), 307-319.

Edell, J. A., & Burke, M. C. (1987). The power of feelings in understanding advertising effects. *Journal of Consumer Research,* 14(3), 421-433.

Fabrigar, L. R., & Petty, R. E. (1999). The role of the affective and cognitive bases of attitudes in susceptibility to affectively and cognitively based persuasion. *Personality and Social Psychology Bulletin,* 25(3), 363-381.

Farshchian, B. A. (2003). Presence technologies for informal collaboration. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 209-223). Amsterdam: IOS Press.

Fazio, R. H., & Zanna, M. P. (1981). Direct experience and attitude-behavior consistency. In L. Berkovitz (Ed.), *Advances in experimental social psychology* (pp. 161-202). New York: Academic Press.

Fazio, R. H., & Olson, M. A. (2003). Attitudes: foundations, functions, and consequences. in M. A. Hogg & J. Cooper (Eds.), *The sage handbook of social psychology* (pp. 139-160). London: Sage.

Fazio, R. H., & Zanna, M. P. (1978). On the predictive validity of attitudes: the role of direct experience and confidence. *Journal of Personality,* 46(2), 228-243.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

Ford, G. T., Smith, D. B., & Swasy, J. L. (1990). Customer skepticism of advertising claims: testing hypotheses from economics of information. *Journal of Consumer Research,* 16(March), 433-441.

Ford, G. T., Smith, D. B., & Swasy, J. L. (1988). An empirical test of the search, experience and credence attribute framework. *Advances in Consumer Research,* 15, 239-244.

Forgas, J. P. (1995). Mood and judgment: The Affect Infusion Model (AIM). *Psychological Bulletin,* 117(1), 39-66.

Fornell, C., & Yi, Y. (1992). Assumptions of the two-step approach: Reply to Anderson and Gerbing. *Sociological Methods & Research,* 20(3), 334-339.

Fornell, C., & Yi, Y. (1992). Assumptions of the two-step approach to latent variable modeling. *Sociological Methods & Research,* 20(3), 291-320.

Friedman, T. L. (2005). *The world is flat. A brief history of the twenty-first century*. New

York, NY: Farrar, Straus and Giroux.

Friestad, M., & Wright, P. (1995). Persuasion knowledge: lay people's and researchers' beliefs about the psychology of advertising. *Journal of Consumer Research,* 22(1), 62-74.

Garbarino, E. C., & Edell, J. A. (1997). Cognitive effort, affect, and choice. *Journal of Consumer Research,* 24(September), 147-158.

Gerbing, D. W., & Anderson, J. C. (1988). An updated paradigm for scale development incorporating unidimensionality and its assessment. *Journal of Marketing Research,* XXV, 186-192.

Gibson, J. J. (1966). *The senses considered as perceptual systems*. Boston: Houghton Mifflin.

Grigorovici, D. (2003). Persuasive effects of presence in immersive virtual environments. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 191-207). Amsterdam: IOS Press.

Hatada, T., Sakata, H., & Kusaka, H. (1980). Psychophysical analysis of the 'sensation of reality' induced by a visual wide-field display. *SMPTE Journal,* 89, 560-569.

Havlena, W. J., & Holbrook, M. B. (1986). The varieties of consumption experience: Comparing two typologies of emotion in consumer behavior. *Journal of Consumer Research,* 13(3), 394-404.

Hayduk, L. A., & Glaser, D. N. (2000). Doing the four-step, right-2-3, wrong-2-3: a brief reply to Mulaik and Millsap; Bollen; Bentler; and Herting and Costner. *Structural Equation Modeling,* 7(1), 111-123.

Hayduk, L. A., & Glaser, D. N. (2000). Jiving the four-step, waltzing around factor analysis, and other serious fun. *Structural Equation Modeling,* 7(1), 1-35.

Heeter, C. (1992). Being there: the subjective experience of presence. *Presence: Teleoperators and Virtual Environments,* 1, 262-271.

Held, R., & Durlach, N. (1992). Telepresence. *Presence: Teleoperators and virtual environments,* 1(1) , 109-112.

Henshel, R. D. (1980). The purposes of laboratory experimentation and the virtues of deliberate artificiality. *Journal of Experimental Social Psychology,* 16, 466-478.

Hirschman, E. C., & Holbrook, M. B. (1982). Hedonic consumption: emerging concepts, methods, and propositions. *Journal of Marketing,* 46(3), 92-101.

Hoch, S. J. (2002). Product experience is seductive. *Journal of Consumer Research,* 29(3), 448-454.

Hoffman, D. L., Novak, T. P., & Venkatesh, A. (2004). Has the Internet become indispensable? *Communications of the ACM,* 47(7), 37-42.

Hofmann, J., & Bubb, H. (2003). Presence in industrial virtual environment applications - susceptibility and measurement reliability. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 237-247). Amsterdam: IOS Press.

Holbert, R. L., & Stephenson, M. T. (2003). The importance of indirect effects in media effects research: testing for mediation in structural equation modeling. *Journal of Broadcasting & Electronic Media,* 47(4), 556-572.

Holbrook, M. B., & Batra, R. (1987). Assessing the role of emotions as mediators of consumer responses to advertising. *Journal of Consumer Research,* 14(3), 404-420.

Horton, D., & Wohl, R. R. (1956). Mass communication and para-social interaction: observations on intimacy at a distance. *Psychiatry,* 19(3), 215-229.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling,* 6(1), 1-55.

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparametrized model misspecification. *Psychological Methods,* 3(4), 424-453.

Hutchins, E. L., Hollan, J. D., & Norman, D. A. (1985). Direct manipulation interfaces. *Human-Computer Interaction,* 1, 311-338.

IJsselsteijn, W., & Riva, G. (2003). Being there: the experience of presence in mediated environments. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 3-16). Amsterdam: IOS Press.

IJsselsteijn, W. A., de Ridder, H., Freeman, J., & Avons, S. E. (2000). Presence: concepts, determinants and measurement. Proceedings of the SPIE, Human Vision and Electronic Imaging V, San Jose, Ca.

Jiang, Z.,& Benbasat, I. (2003). The effects of interactivity and vividness of functional control in changing web consumers' attitudes. Proceedings of the Twenty-Fourth Conference on Information Systems, Seattle WA

Jiang, Z., & Benbasat, I. (2004-2005). Virtual product experience: effects of visual and functional control of products on perceived diagnosticity and flow in electronic shopping. *Journal of Management Information Systems,* 21(3), 111-147.

Kardes, F. R. (1996). In defense of experimental consumer psychology. *Journal of Consumer Psychology,* 5(3), 279-296.

Kempf, D. S., & Smith, R. E. (1998). Consumer processing of product trial and the influence of prior advertising: A structural modeling approach. *Journal of Marketing Research,* 35(3), 325-338.

Kim, T. (1996). Effects of presence on memory and persuasion. Unpublished doctoral dissertation, University of North Carolina.

Kim, T., & Biocca, F. (1997). Telepresence via television: two dimensions of telepresence may have different connections to memory and persuasion. *Journal of Computer Mediated Communication,* 3(2)

Kirmani, A., & Rao, A. R. (2000). No pain, no gain: a critical review of the literature on signaling unobservable product quality. *Journal of Marketing,* 64(April), 66-79.

Klein, L. R. (2003). Creating virtual product experiences: the role of telepresence. *Journal of Interactive Marketing,* 17(1), 41-55.

Klein, L. R. (1998). Evaluating the potential of interactive media through a new lens: search versus experience goods. *Journal of Business Research,* 41, 195-203.

Kline, R. B. (2005). *Principles and practice of structural equation modeling*. Ney York: Guilford.

Krueger, M. W. (1991). *Artificial Reality*. Reading, MA: Addison-Wesley.

Kumar, N., & Benbasat, I. (2002). Para-social presence and communication capabilities of a web site: A theoretical perspective. *e-Service Journal,* 1(3), 5-24.

Lal, R., & Sarvary, M. (1999). When and how is the Internet likely to decrease price competition? *Marketing Science,* 18(4), 485-503.

Lee, K. M. (2004). Presence, explicated. *Communication Theory,* 14(1), 27-50.

Lee, W., & Benbasat, I. (2003). Designing an electronic commerce interface: attention and product memory as elicited by web design. *Electronic Commerce Research and Applications ,* 2(3), 240-253.

Lemish, D. (1982). The rules of viewing television in public places. *Journal of Broadcasting,* 26(4), 757-781.

Lessiter, J., Freeman, J., Keogh, E., & Davidoff, J. (2001). A cross-media presence questionnaire: the ITC-Sense of Presence Inventory. *Presence: Teleoperators and Virtual Environments,* 10(3), 282-297.

Li, H., Daugherty, T., & Biocca, F. (2001). Characteristics of virtual experience in electronic commerce: a protocol analysis. *Journal of Interactive Marketing,* 15(3), 13-30.

Li, H., Daugherty, T., & Biocca, F. (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.

Li, H., Daugherty, T., & Biocca, F. (2003). The role of virtual experience in consumer learning. *Journal of Consumer Psychology,* 13(4), 395-407.

Lim, K. H., & Benbasat, I. (2000). The effect of multimedia on perceived equivocality and perceived usefulness of information systems. *MIS Quarterly,* 24(3), 449-471.

Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association,* 83(404), 1198-1202.

Lombard, M. (1995). Direct responses to people on the screen: Television and personal space. *Communication Research,* 22(3), 288-324.

Lombard, M., & Ditton, T. (1997). At the heart of it all: the concept of presence. *Journal of Computer-Mediated Communication,* 3(2)

Lombard, M., Reich, R. D., Grabe, M. E., Bracken, C. C., & Ditton, T. B. (2000). Presence and television: The role of screen size. *Human Communication Research,* 26(1), 75-98.

Lombard, M., & Snyder-Duch, J. (2001). Interactive advertising and presence: a framework. *Journal of Interactive Advertising,* 1(2)

Lynch, J. G. (1982). On the external validity of experiments in consumer research. *Journal of Consumer Research,* 9(December), 225-239.

Lynch, J. G. (1999). Theory and external validity. *Journal of the Academy of Marketing Science,* 27(3), 367-376.

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods,* 1(2), 130-149.

MacKenzie, S. B., & Lutz, R. J. (1989). An empirical examination of the structural

antecedents of attitude toward the ad in an advertising pretesting context. *Journal of Marketing,* 53(2), 48-65.

MacKenzie, S. B., Lutz, R. J., & Belch, G. E. (1986). The role of attitude towards the ad as a mediator of advertising effectiveness: A test of competing explanations. *Journal of Marketing Research,* 23(2), 130-143.

MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods,* 7(1), 83-104.

Mano, H. (1991). The structure and intensity of emotional experiences: Method and context convergence. *Multivariate Behavioral Research,* 26(3), 389-411.

Mano, H., & Oliver, R. L. (1993). Assessing the dimensionality and structure of the consumption experience: Evaluation, feeling, and satisfaction. *Journal of Consumer Research,* 20(3) , 451-466.

Mantovani, F., & Castelnuovo, G. (2003). Sense of presence in virtual training: enhancing skills acquisition and transfer of knowledge through learning experience in virtual environments. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 167-183). Amsterdam: IOS Press.

Mantovi, G., & Riva, G. (1999). "Real" presence: How different ontologies generate different criteria for presence, telepresence, and virtual presence. *Presence,* 8(5), 540-550.

Markus, M. L. (1994). Electronic mail as the medium of managerial choice. *Organization Science,* 5(4), 502-527.

Marsh, H. W., Hau, K.-T., & Wen, Z. (2004). In search of golden rules: comment on hypothesis-testing-approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling,* 11(3), 320-341.

Mathur, D. C. (1971). *Naturalistic philosophies of experience*. St. Louis, MO: Warren H. Green.

McCabe, D. B., & Nowlis, S. M. (2003). The effect of examining actual products or product descriptions on consumer preference. *Journal of Consumer Psychology,* 13(4), 431-439.

McDonald, R. P., & Ho, M.-H. R. (2002). Principles and practice in reporting structural equation modeling. *Psychological Methods,* 7(1), 64-82.

McGrath, J. E. (1982). Dilemmatics: The study of research choices and dilemmas. in J. E. McGrath, J. Martin, & R. A. Kulka (Eds.), *Judgment calls in research* (pp. 69-101). Beverly Hills: Sage.

Mehrabian, A. (1974). *An approach to environmental psychology*. Cambridge, MA: MIT Press.

Mehrabian, A. (1995). Framework for a comprehensive description and measurement of emotional states. *Genetic, Social & General Psychology Monographs,* 121(3), 341-361.

Micceri, T. (1989). The unicorn, the normal curve, and other improbable creatures. *Psychological Bulletin,* 105(1), 156-166.

Millar, M. G., & Millar, K. G. (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.

Mittal, B. (1995). A comparative analysis of four scales of consumer involvement. *Psychology & Marketing,* 12(7), 663-682 .

Mook, D. G. (1983). In defense of external invalidity. *American Psychologist,* 38, 379-387.

Moon, Y., & Nass, C. (1998). Are computers scapegoats? Attributions of responsibility in human-computer interaction. *International Journal of Human-Computer Studies,* 49(1), 79-94.

Mulaik, S. A., & Millsap, R. E. (2000). Doing the four-step right. *Structural Equation Modeling,* 7(1), 36-73.

Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues,* 56(1), 81-103.

Nass, C., Moon, Y., & Carney, P. (1999). Are respondents polite to computers? Social desirability and direct responses to computers. *Journal of Applied Social Psychology,* 29(5), 1093-1110.

Nass, C., Moon, Y., Fogg, B. J., Reeves, B., & Dryer, D. C. (1995). Can computer personalities be human personalities? *International Journal of Human-Computer Studies,* 43(2), 223-239.

Nelson, P. (1974). Advertising as information. *Journal of Political Economy,* 82, 729-754.

Nelson, P. (1970). Information and consumer behavior. *Journal of Political Economy,* 78, 311-329.

Nicholson, D. B. (2005). Virtual product experience: an empirical investigation of technology and individual characteristics on consumer psychology and intentions. Unpublished doctoral dissertation, Washington State University.

Novak, T. P., Hoffman, D. L., & Yung, Y.-F. (2000). Measuring the customer experience in online environments: a structural modeling approach. *Marketing Science,* 19(1), 22-42.

Park, C. W., Jaworski, B. J., & MacInnis, D. J. (1986). Strategic brand-concept image management. *Journal of Marketing,* 50(4), 135-145.

Petty, R. E., Gleicher, F., & Baker, S. M. (1991). Multiple roles for affect in persuasion. in J. P. Forgas (Ed.), *Emotion and social judgments* (pp. 181-200). Oxford: Pergamon.

Pham, M. T. (1998). Representativeness, relevance, and the use of feelings in decision making. *Journal of Consumer Research,* 25(September), 144-159.

Pham, M. T., Cohen, J. B., Pracejus, J. W., & Hughes, G. D. (2001). Affect monitoring and the primacy of feelings in judgment. *Journal of Consumer Research,* 28(1), 167-188.

Reid, D. (2004). A model of playfulness and flow in virtual reality interactions. *Presence: Teleoperators and Virtual Environments,* 13(4), 451-462.

Rice, E. R., & Gattiker, U. E. (2001). New media and organizational structuring. F. M. Jablin & L. L. Putnam (Eds.), *The new handbook of organizational communication* (pp. 440-502).

Riva, G. (2003). Virtual reality as communication tool: a socio-cognitive analysis. In G. Riva & F. Davide (Eds.), *Communications through virtual technology: identity community and technology in the Internet age* (pp. 47-56). Amsterdam: IOS Press.

Riva, G. (2002). Virtual reality for health care: The status of research. *CyberPsychology & Behavior,* 5(3), 219-225.

Riva, G. (2005). Virtual reality in psychotherapy: review. *CyberPsychology & Behavior,* 8(3), 220-230.

Rothbaum, B. O., & Hodges, L. F. (1999). The use of virtual reality exposure in the treatment of anxiety disorders. *Behavior Modification,* 23(4), 507.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology,* 39(6), 1161-1178.

Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect.

Psychological Bulletin, 125(1), 3-30.

Schlosser, A. E. (2003). Experiencing products in the virtual world: the role of goal and imagery in influencing attitudes versus purchase intentions. *Journal of Consumer Research,* 30(September), 184-198.

Schlosser, A. E. (2006). Learning through virtual experience: the role of imagery on true versus false memories. *Journal of Consumer Research,* 33(3), 377-383.

Schuemie, M. J., Van der Straaten, M. K., & Van der Mast, C. A. G. P. (2001). Research on presence in virtual reality: a survey. *CyberPsychology and Behavior,* 4(2), 183-201.

Schwarz, N. (1990). Feelings as information: informational and motivational functions of affective states. In E. T. Higgins & R. Sorrentino (Eds.), *Handbook of motivation and cognition: foundations of social behavior* (pp. 527-561). New York, NY: Guilford.

Schwarz, N., & Clore, G. L. (1988). How do I feel about it? Informative functions of affective states. in K. Fiedler & J. Forgas (Eds.), *Affect, cognition, and social behavior* (pp. 44-62). Toronto: Hogrefe International.

Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: informative and directive functions of affective states. *Journal of Personality and Social Psychology,* 45(3), 513-523.

Segars, A. H. (1997). Assessing the unidimensionality of measurement: a paradigm and illustration within the context of information systems. *Omega,* 25(1), 107-121.

Sheridan, T. B. (1992). Musings on telepresence and virtual presence. *Presence: Teleoperators and Virtual Environments,* 1(1), 120-126.

Shneiderman, B. (1983). Direct Manipulation: a step beyond programming languages. *IEEE Computer,* 16(8), 57-69.

Shneiderman, B. (1984). The future of interactive systems and the emergence of direct manipulation. Human factors and interactive computer systems: Proceedings of the NYU symposium on user interfaces, New York

Short, J., Williams, E., & Christie, B. (1976). *The social psychology of telecommunications*. London: Wiley.

Slater, M. (1999). Measuring presence: a response to the Witmer and Singer presence Questionnaire. *Presence: Teleoperators and Virtual Environments,* 8(5), 560-565.

Slater, M., & Wilbur, S. (1997). A framework for immersive virtual environments

(FIVE): speculations on the role of presence in virtual environments. *Presence: Teleoperators and Virtual Environments,* 6(6), 603-616.

Smith, D. C., & Park, C. W. (1992). The effects of brand extensions on market share and advertising efficiency. *Journal of Marketing Research,* 29(3), 296-313.

Smith, R. E. (1993). Integrating information from advertising and trial: processes and effects on consumer response to product information. *Journal of Marketing Research,* 30(2), 204-219.

Smith, R. E., & Swinyard, W. R. (1988). Cognitive response to advertising and trial: belief strength, belief confidence, and product curiosity. *Journal of Advertising,* 17(3), 3-14.

Spangenberg, E. R., Voss, K. E., & Crowley, A. E. (1997). Measuring the hedonic and utilitarian dimensions of attitude: a generally applicable scale. M. Brucks & D. J. MacInnis (Eds.), *Advances in Consumer Research* (pp. 235-241). Provo, UT: Association for Consumer Research.

Springer, M. D., & Thompson, W. E. (1966). The distribution of products of independent random variables. *SIAM Journal on Applied Mathematics,* 14(3), 511-526.

Steuer, J. (1992). Defining virtual reality: dimensions determining telepresence. *Journal of Communication,* 42(4), 73-93 .

Strahilevitz, M., & Myers, J. G. (1998). Donations to charity as purchase incentives: How well they work may depend on what you are trying to sell. *Journal of Consumer Research,* 24(4) , 434.

Straub, D., Boudreau, M.-C., & Gefen, D. (2004). Validation guidelines in IS positivist research. *Communications of the AIS,* 13(24), 380-427.

Suh, K.-S., & Chang, S. (2006). User interfaces and consumer perceptions of online stores: The role of telepresence. *Behavior & Information Technology,* 25(2), 99-113.

Suh, K.-S., & Lee, Y. E. (2005). The effects of virtual reality on consumer learning: an empirical investigation. *MIS Quarterly,* 29(4), 673-697.

Sun, H., & Zhang, P. (2006). The role of affect in information systems research: A critical survey and research model. in P. Zhang & D. Galetta (Eds.), *HCI in MIS (I): Foundations* Armonk, NY: M.E. Sharpe.

Tomarken, A. J., & Waller, N. G. (2003). Potential problems with "well fitting" models. *Journal of Abnormal Psychology,* 112(4), 578-598.

Tomarken, A. J., & Waller, N. G. (2005). Structural Equation Modeling: Strengths, limitations, and misconceptions. *Annual Review of Clinical Psychology,* 1, 31-65.

U.S. Census Bureau News. (2007). *Quarterly retail e-commerce sales 1st quarter 2007. Report No. CB07-68*. Washington, DC: U.S. Department of Commerce.

U.S. Census Bureau News. (2007). *Quarterly retail e-commerce sales 4th quarter 2006. Report No. CB07-23*. Washington, DC: U.S. Department of Commerce.

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences,* 27(3), 451.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of technology: toward a unified view. *Management Information Systems Quarterly,* 27(3), 425-278.

Venkatesh, V., Speier, C., & Morris, M. G. (2002). User acceptance enablers in individual decision making about technology: Toward an integrated model. *Decision Sciences,* 33(2), 297-316.

Voss, K. E., Spangenberg, E. R., & Grohmann, B. (2003). Measuring the hedonic and utilitarian dimensions of consumer attitude. *Journal of Marketing Research,* 11(August), 310-320.

Walsh, K. R., & Pawlowski, S. D. (2002). Virtual reality: A technology in need of IS research. *Communications of the AIS,* 8, 297-313.

Waterworth, E. L., & Waterworth, J. A. (2003). The illusion of being creative. In G. Riva, F. Davide, & W. IJsselsteijn (Eds.), *Being there: concepts, effects, and measurement of user presence in synthetic environments* (pp. 223-236). Amsterdam: IOS Press.

Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: development of a measure with workplace implications. *MIS Quarterly,* 16(2), 201-226.

Webster, J., & Trevino, L. K. (1995). Rational and social theories as complementary explanations of communication media choices: Two policy capturing studies. *Academy of Management Journal,* 38(6), 1544-1572.

Welch, R. B. (1999). How can we determine if the sense of presence affects task performance. *Presence: Teleoperators and Virtual Environments,* 8(5), 574-577.

Wells, W. D. (1993). Discovery-oriented consumer research. *Journal of Consumer Research,* 19(4), 489-504.

Wells, W. D. (2001). The perils of *N*=1. *Journal of Consumer Research,* 28(3), 494-498.

Winer, R. S. (1999). Experimentation in the 21st century: the importance of external validity. *Journal of the Academy of Marketing Science,* 27(3), 349-358.

Witmer, B. G., & Singer, M. G. (1998). Measuring presence in virtual environments. *Presence: Teleoperators and Virtual Environments,* 7(3), 225-240.

Woods, W. A. (1960). Psychological dimensions of consumer decision. *Journal of Marketing,* 24(1), 15-19.

Zaichkowski, J. L. (1986). Conceptualizing involvement. *Journal of Advertising,* 15(2), 4-14.

Zaichkowski, J. L. (1985). Measuring the involvement construct. *Journal of Consumer Research,* 12(3), 341-352.

Zaichkowski, J. L. (1994). The personal involvement inventory: Reduction, revision, and application to advertising. *Journal of Advertising,* 23(4), 59-70.

Zajonc, R. B., & Markus, H. (1982). Affective and cognitive factors in preferences. *Journal of Consumer Research,* 9(September), 123-131.

Zimbardo, P. G., & Gerrig, R. J. (2000). Perception. In D. J. Levitin (Ed.), *Foundations of cognitive psychology: core readings* (pp. 133-188). Cambridge, Ma.: MIT Press.

Appendix A – Measures

Table A - 1 – Order of Measures (Study 1)

Order	Item
1	ITC-SOPI
2	Affective Reactions
3	Cognitive Reactions
4	Manipulation Check (Hed/Ut)
5	Attitudes
6	Intentions
7	Product Class Knowledge
8	Virtual Reality Knowledge
9	Product Involvement
10	Style of Processing
11	Need for Tactile Input
12	Computer Playfulness
13	Manipulation Check (Interactivity)
14	Demographics

Table A - 2 – Order of Measures (Study 2)

Order	Item
1	ITC-SOPI
2	Affective Reactions
3	Cognitive Reactions
4	Manipulation Check (Hed/Ut)
5	Attitudes
6	Intentions
7	Product Class Knowledge
8	Virtual Reality Knowledge
9	Product Involvement
10	Style of Processing
11	Need for Tactile Input
12	Computer Playfulness
13	Manipulation Check (Interactivity)
14	Manipulation Check (Hed/Ut) II
15	Profession
16	Demographics

Table A - 3 - Presence

The following items of the ITC – SOPI (Lessiter et al., 2001) were used: B4 B5 B6 B11 B12 B15 B19 B36 *This measure is copyrighted, please contact Lessiter et al. for access to the items.*

Table A - 4 - Affective Responses

Pleasure (Mehrabian, 1974)	
Label	**Item**
feel1	Happy – Unhappy
feel2	Pleased – Annoyed
feel3	Satisfied – Unsatisfied
feel4	Contented – Melancholic
feel5	Hopeful – Despairing
feel6	Relaxed – Bored
Arousal (Mehrabian, 1974)	
Label	**Item**
feel7	Stimulated – Relaxed
feel8	Excited – Calm
feel9	Frenzied – Sluggish
feel10	Jittery – Dull
feel11	Wide-awake – Sleepy
feel12	Aroused – Unaroused
All item pairs were separated by 9 spaces.	

Table A - 5 - Cognitive Reactions (Study 1)

Label	**Item**
Ease of use (Davis, 1989)	
eou1	Learning to operate the Kodak digital camera would be easy for me.
eou2	I would find it easy to get the Kodak digital camera to do what I want it to do.
eou3	My interaction with the Kodak digital camera would be clear and understandable.
eou4	I would find the Kodak digital camera to be flexible to interact with.
eou5	It would be easy for me to become skillful at using the Kodak digital camera.
eou6	I would find the Kodak digital camera easy to use.
Shape-size (Nicholson, 2005)	
Label	**Item**
shape1	The shape or size of the Kodak digital camera is awkward.
shape2	The shape or size of the Kodak digital camera is ideal.
shape3	The shape or size of the Kodak digital camera is convenient.
Quality (Dodds et al., 1991; Nicholson, 2005)	
Label	**Item**
qual1	How likely is it that the Kodak digital camera would be reliable?
qual2	How likely is it that the Kodak digital camera is of high quality workmanship?
qual3	How likely is it that the Kodak camera is dependable?
qual4	How likely is it that the Kodak digital camera is durable?
qual5	The Kodak digital camera is of very (low – high) quality *(anchored at very low quality and very high quality)*
Belief Strength (Ajzen & Fishbein, 1980) – *used for every belief*	
Label	**Item**
xxx_cert	How certain are you?
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 6 - Cognitive Reactions (Study 2)

Label	**Item**
Ease of use (Davis, 1989)	
eou1	Learning to operate the Motorola cell phone would be easy for me.
eou2	I would find it easy to get the Motorola cell phone to do what I want it to do.
eou3	My interaction with the Motorola cell phone would be clear and understandable.
eou4	I would find the Motorola cell phone to be flexible to interact with.
eou5	It would be easy for me to become skillful at using the Motorola cell phone.
eou6	I would find the Motorola cell phone easy to use.
Shape-size (Nicholson, 2005)	
Label	**Item**
shape1	The shape or size of the Motorola cell phone is awkward.
shape2	The shape or size of the Motorola cell phone is ideal.
shape3	The shape or size of the Motorola cell phone is convenient.
Quality (Dodds et al., 1991; Nicholson, 2005)	
Label	**Item**
qual1	How likely is it that the Motorola cell phone would be reliable?
qual2	How likely is it that the Motorola cell phone is of high quality workmanship?
qual3	How likely is it that the Motorola cell phone is dependable?
qual4	How likely is it that the Motorola cell phone is durable?
qual5	The Motorola cell phone is of very (low – high) quality *(anchored at very low quality and very high quality)*
Belief Strength (Ajzen & Fishbein, 1980) – *used for every belief*	
Label	**Item**
xxx_cert	How certain are you?
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 7 – Manipulation Check Hedonic/Utilitarian (Study 1)

Label	Item
Hed/Ut (Voss et al., 2003)	
The Kodak digital camera is	
hed1	Not fun – Fun
hed2	Dull – Exciting
hed3	Not delightful – Delightful
hed4	Not thrilling – Thrilling
hed5	Enjoyable – Unenjoyable
util1	Effective – Ineffective
util2	Helpful – Unhelpful
util3	Functional – Not functional
util4	Necessary – Unnecessary
util5	Practical – Impractical
All items were measured using 7-point Likert-type scales.	

Table A - 8 – Manipulation Check Hedonic/Utilitarian (Study 2

Label	Item
Hed/Ut (Voss et al., 2003)	
The Motorola phone is	
hed1	Not fun – Fun
hed2	Dull – Exciting
hed3	Not delightful – Delightful
hed4	Not thrilling – Thrilling
hed5	Enjoyable – Unenjoyable
util1	Effective – Ineffective
util2	Helpful – Unhelpful
util3	Functional – Not functional
util4	Necessary – Unnecessary
util5	Practical – Impractical
All items were measured using 7-point Likert-type scales.	

Table A - 9 – Manipulation Check Hedonic/Utilitarian II (Study 2)

Label	Item
Hed/Ut (Voss et al., 2003)	
On the website, the Motorola phone is *POSITIONED* as...	
hed1	Not fun – Fun
hed2	Dull – Exciting
hed3	Not delightful – Delightful
hed4	Not thrilling – Thrilling
hed5	Enjoyable – Unenjoyable
util1	Effective – Ineffective
util2	Helpful – Unhelpful
util3	Functional – Not functional
util4	Necessary – Unnecessary
util5	Practical – Impractical
All items were measured using 7-point Likert-type scales.	

Table A - 10 – Attitudes (Study 1)

Label	Item
Attitudes (Kempf & Smith, 1998)	
The Kodak digital camera is	
attgp1	Good – Bad
attgp2	Favorable – Unfavorable
attgp3	Likeable – Dislikeable
All items were measured using 7-point Likert-type scales.	

Table A - 11 – Attitudes (Study 2)

Label	Item
Attitudes (Kempf & Smith, 1998)	
The Motorola phone is	
attgp1	Good – Bad
attgp2	Favorable – Unfavorable
attgp3	Likeable – Dislikeable
All items were measured using 7-point Likert-type scales.	

Table A - 12 – Intentions (Study 1)

Label	Item
Intentions to Purchase (Coyle & Thorson, 2001)	
intp1	It is very likely that I will buy the Kodak digital camera
intp2	I will purchase Kodak the next time I need a digital camera
intp3	I will definitely try Kodak
intp4	Suppose that a friend called you last night to get your advice in his/her search for a digital camera. Would you recommend him/her to buy a digital camera from Kodak? *(anchored at definitely would and definitely would not)*
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 13 – Intentions (Study 2)

Label	Item
Intentions to Purchase (Coyle & Thorson, 2001)	
intp1	It is very likely that I will buy the Motorola phone
intp2	I will purchase Motorola the next time I need a cell phone
intp3	I will definitely try Motorola
intp4	Suppose that a friend called you last night to get your advice in his/her search for a cell phone. Would you recommend him/her to buy a cell phone from Motorola? *(anchored at definitely would and definitely would not)*
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 14 – Product Class Knowledge (Study 1)

Label	Item
Product Class Knowledge (Nicholson, 2005; Smith & Park, 1992)	
knowl1	I know pretty much about how digital cameras work
konwl2	I do not feel very knowledgeable about how digital cameras function
knowl3	Among my circle of friends, I'm one of the experts on digital cameras
knowl4	Compared to other people, I know less about digital cameras
knowl5	When it comes to digital cameras, I really don't know a lot
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 15 – Product Class Knowledge (Study 2)

Label	Item
Product Class Knowledge (Nicholson, 2005; Smith & Park, 1992)	
knowl1	I know pretty much about how cell phones work
konwl2	I do not feel very knowledgeable about how cell phones function
knowl3	Among my circle of friends, I'm one of the experts on cell phones
knowl4	Compared to other people, I know less about cell phones
knowl5	When it comes to cell phones, I really don't know a lot
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 16 – Virtual Reality Knowledge

Label	Item
Virtual Reality Knowledge (Nicholson, 2005; Smith & Park, 1992)	
knowlvr1	I know pretty much about how 3d images are produced
konwlvr2	I do not feel very knowledgeable about how virtual reality environments are produced
knowlvr3	Among my circle of friends, I'm one of the experts on virtual reality
knowlvr4	Compared to other people, I know less about virtual reality
knowlvr5	When it comes to virtual reality, I really don't know a lot
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 17 – Product Involvement (Study 1)

Label	Item
Product Involvement (Mittal, 1995)	
Digital cameras are	
involv1	Are important – Are unimportant
involv2	Mean a lot to me – Mean nothing to me
involv3	Matter to me – Do not matter to me
involv4	Are significant – Are insignificant
involv5	Are of concern to me – Are of no concern to me
All items were measured using 7-point Likert-type scales.	

Table A - 18 – Product Involvement (Study 2)

Label	Item
Product Involvement (Mittal, 1995)	
Cell phones are	
involv1	Are important – Are unimportant
involv2	Mean a lot to me – Mean nothing to me
involv3	Matter to me – Do not matter to me
involv4	Are significant – Are insignificant
involv5	Are of concern to me – Are of no concern to me
All items were measured using 7-point Likert-type scales.	

Table A - 19 – Style of Processing

Label	Item
Style of Processing (Bezjian-Avery et al., 1998)	
visu1	I like to daydream.
visu2	My thinking always consists of mental images or pictures.
visu3	When I'm learning something new I'd rather watch a demonstration than read how to do it.
visu4	I generally prefer to use a diagram than a written set of instructions.
visu5	I prefer to read instructions about how to do something rather than have someone show me.
visu6	I can never seem to find the right word when I need it.
visu7	I prefer activities that don't require a lot of reading.
visu8	I enjoy doing work that requires the use of words.
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 20 – Need for Tactile Input

Label	Item
Need for Tactile Input (Citrin et al., 2003)	
tact1	I need to touch a product in order to evaluate its quality.
tact2	I need to touch a product in order to evaluate how much I will like the product.
tact3	I feel it necessary to touch a product in order to evaluate its physical characteristics.
tact4	I feel it is necessary to touch a product in order to evaluate its quality.
tact5	I need to touch a product in order to evaluate its physical characteristics.
tact6	I need to touch a product in order to create a general evaluation of it.
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 21 – Computer Playfulness

Label	Item
Computer Playfulness (Webster & Martocchio, 1992)	
playf1	When using the web, I am spontaneous
playf2	When using the web, I am unimaginative
playf3	When using the web, I am flexible
playf4	When using the web, I am creative
playf5	When using the web, I am playful
playf6	When using the web, I am unoriginal
playf7	When using the web, I am uninventive
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 22 – Manipulation Check Hedonic/Utilitarian II (Study 2)

Label	Item
Hed/Ut (Voss et al., 2003)	
On the website, the Motorola phone is *POSITIONED* as...	
hed1	Not fun – Fun
hed2	Dull – Exciting
hed3	Not delightful – Delightful
hed4	Not thrilling – Thrilling
hed5	Enjoyable – Unenjoyable
util1	Effective – Ineffective
util2	Helpful – Unhelpful
util3	Functional – Not functional
util4	Necessary – Unnecessary
util5	Practical – Impractical
All items were measured using 7-point Likert-type scales.	

Table A - 23 – Manipulation Check Interactivity (Study 1)

Label	Item
Adapted from (Nicholson, 2005)	
inter1	The website provided the ability to rotate the digital camera by grabbing it
inter2	The website provided the ability to bring the digital camera closer to me
inter3	The website provided the ability to directly manipulate the digital camera's features
inter4	I would describe the website as very interactive
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 24 – Manipulation Check Interactivity (Study 2)

Label	Item
Adapted from (Nicholson, 2005)	
inter1	The website provided the ability to rotate the cell phone by grabbing it
inter2	The website provided the ability to bring the cell phone closer to me
inter3	The website provided the ability to directly manipulate the cell phone's features
inter4	I would describe the website as very interactive
All items were measured using 7-point Likert-type scales anchored at strongly agree, neither agree nor disagree, and strongly disagree.	

Table A - 25 – Demographics (Study 1)

What is your age?

What is your gender?
Female / Male

What is your mother tongue?
English / other:

What is your class standing?
Freshman / Sophomore / Junior / Senior / Graduate

What is your Major/intended Major?

What is your current GPA?

Do you own a digital camera
Yes / No
If yes, what brand/model do you own?

Do you own a cell phone with camera functionality?
Yes / No
If yes, how often do you use the camera?
Never / Rarely (once a week) / Sometimes (more than once a week) / a lot (at least once a day)

Rate your level of computer expertise
None / Basic / Intermediate / Expert

Rate how often you play computer/video games
Never / Occasionally (once or twice a month) / Often, but less than 50% of the days of the month / 50% of the days or more in a month / every day

Rate your average weekly TV viewing
0-8 hours / 9-16 hours / 17-24 hours / 25-32 hours / 33-40 hours / 41 hours or more

How many TVs do you own or have in your residence?
None / 1 / 2 / 3 / 4 or more

If you have 1 or more TVs, what is the size of your LARGEST TV?
Small/portable (14" or less) / Medium (15" to 28") / Large (28" to 42") / Extra Large (over 42")

How would you rate your level of TV/film production knowledge?
None / Basic / Intermediate / Expert

Have you viewed stereoscopic (3D) images using polarised glasses (e.g. IMAX 3D) before?
Yes / No

Have you used an experimental virtual reality system before (beyond a consumer computer/arcade game)?
Yes / No

Table A - 26 - Profession (Study 2 only)

What is you current or most recent primary profession?
Student
Never/Not in Work Force
Government Professional
Social Worker
Advertising Professional
Attorney or Judge
Education Administrator
Engineering Technician/Support
Facilities Maintenance Manager/Worker
Livestock Producer
Dentist or Orthodontist
Nurse, Nurse Practitioner, or Physicians Assistant
Physician
Hotel/Amusements/Recreation Worker
Other Human Resources Professional
Other Computer or Internet Specialty
Maintenance/Mechanic/Repair Worker
Military
Editor/Writer/Media Worker (Print, Internet, Broad)
Protective Services (police, fire, parole officer)
Religious Professional
Sales Representative, Retail or Personal Services
Sales Representative, Other
Other Financial Professional
Science/Medical Lab Technician
Tradesperson (e.g., plumber, seamstress)
Transportation/Equipment Operator/Worker
Veterinarian

Business Executive
Legal Professional
Administrative Assistant/Secretary
Artist/Designer/Architect
Construction Contractor/Worker
Engineer
Entertainer/Performer/Sports Professional
Farming/Fishing/Forestry Worker
Food Preparation/Service Worker
Healthcare Administrator
Pharmacist
Other Healthcare Professional
Human Resources Benefits Coordinator
IT Manager/Network Administrator
Machine Operator/Assembly/Production Worker
Marketing/Public Relations Professional
Personal Care/Services Worker
Professor/Instructor, Higher Education
Purchasing Agent or Buyer
Real Estate Agent
Sales Representative, Financial or Insurance
Stockbroker
Scientist, Biological/Physical/Social
Teacher/Instructor, K-12
Traffic, Shipping, or Receiving Clerk/Worker
Travel Agent
Some Other Profession

Table A - 27 – Demographics (Study 2)

What is your age?

What is your gender?
Female / Male

What is your mother tongue?
English / other:

Do you own a cell phone
Yes / No
If yes, what brand/model do you own?

If yes, does your cell phone have camera functionality?
Yes / No
If yes, how often do you use the camera?
Never / Rarely (once a week) / Sometimes (more than once a week) / a lot (at least once a day)

Rate your level of computer expertise
None / Basic / Intermediate / Expert

Rate how often you play computer/video games
Never / Occasionally (once or twice a month) / Often, but less than 50% of the days of the month / 50% of the days or more in a month / every day

Rate your average weekly TV viewing
0-8 hours / 9-16 hours / 17-24 hours / 25-32 hours / 33-40 hours / 41 hours or more

How many TVs do you own or have in your residence?
None / 1 / 2 / 3 / 4 or more

If you have 1 or more TVs, what is the size of your LARGEST TV?
Small/portable (14" or less) / Medium (15" to 28") / Large (28" to 42") / Extra Large (over 42")

How would you rate your level of TV/film production knowledge?
None / Basic / Intermediate / Expert

Have you viewed stereoscopic (3D) images using polarised glasses (e.g. IMAX 3D) before?
Yes / No

Have you used an experimental virtual reality system before (beyond a consumer computer/arcade game)?
Yes / No

Appendix B – Experimental Manipulations (Study 1)

Figure B - 1 - Introductory Screen, Utilitarian Condition

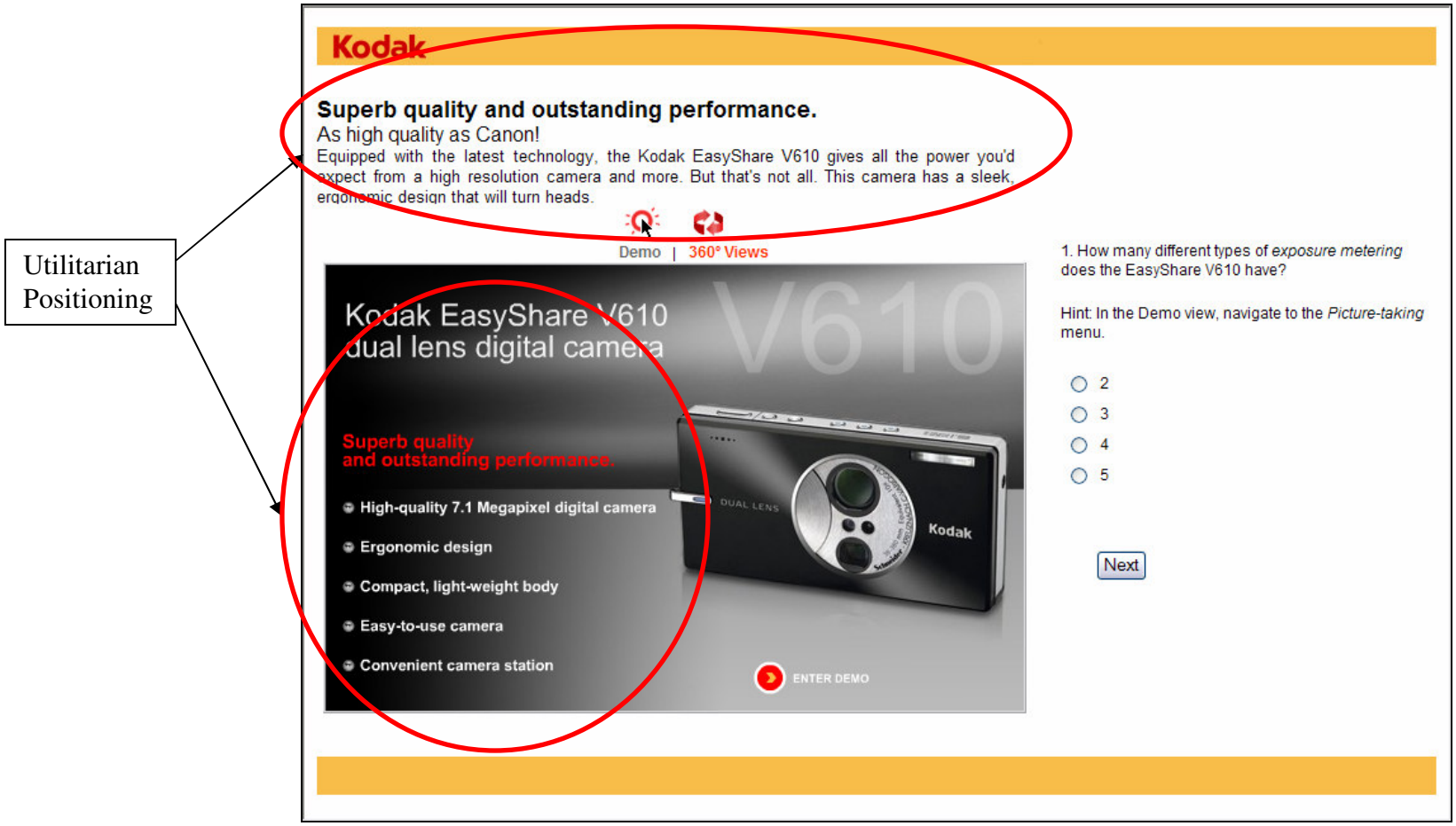


Figure B - 2 - Introductory Screen, Hedonic Condition

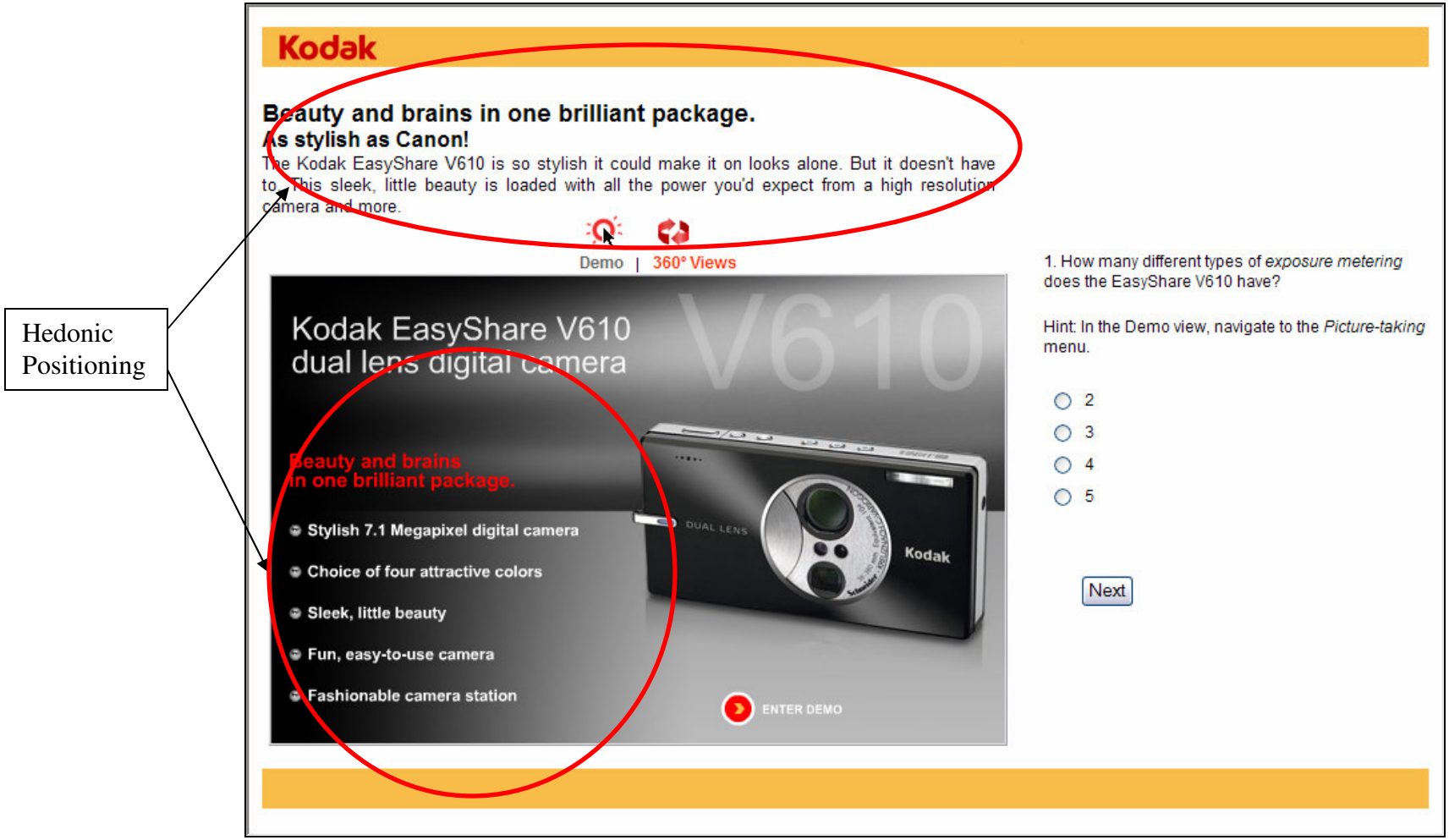


Figure B - 3 - Interactivity Manipulation (Functional Control), Static Condition

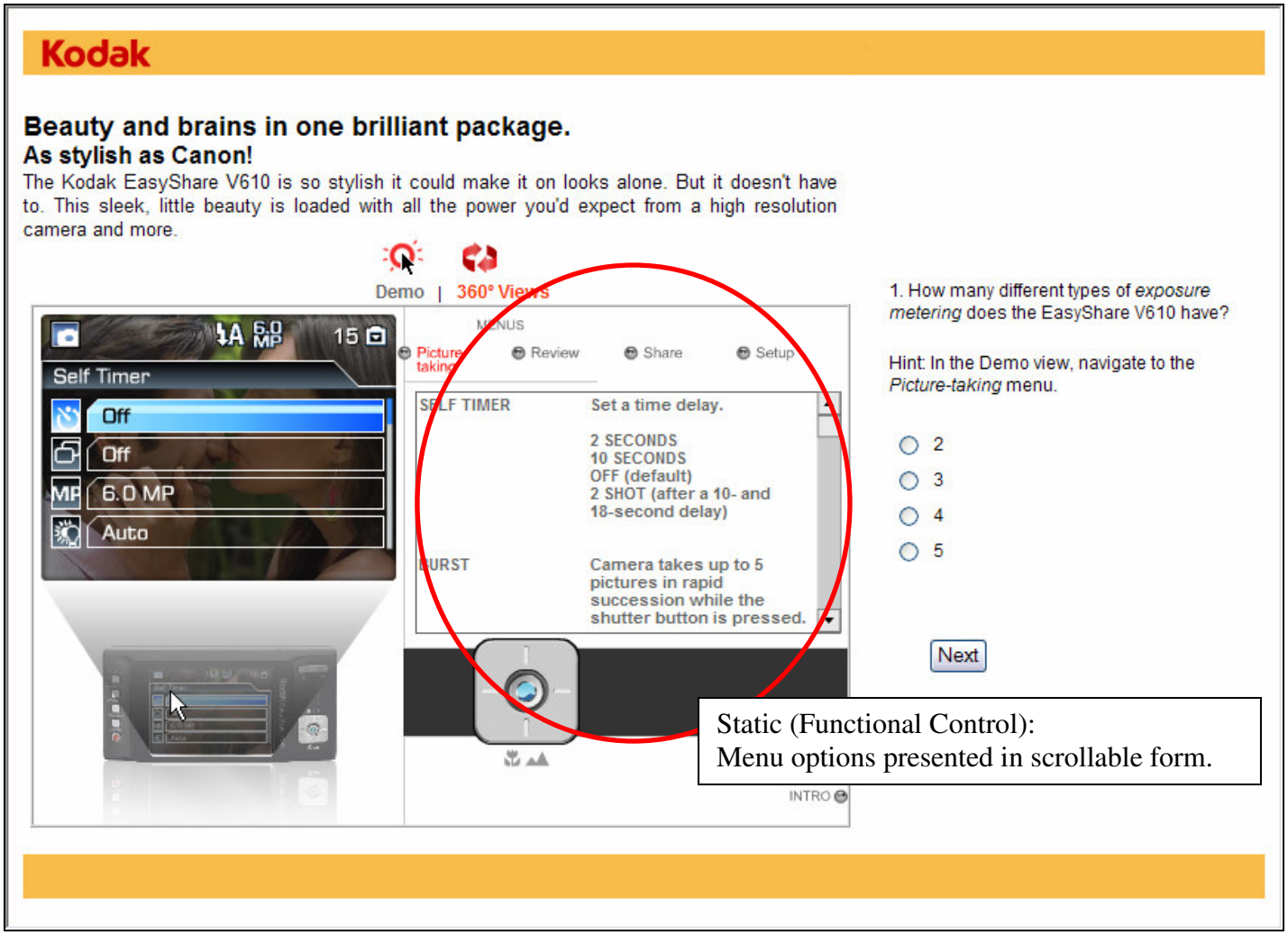


Figure B - 4 - Interactivity Manipulation (Functional Control), Interactive Condition

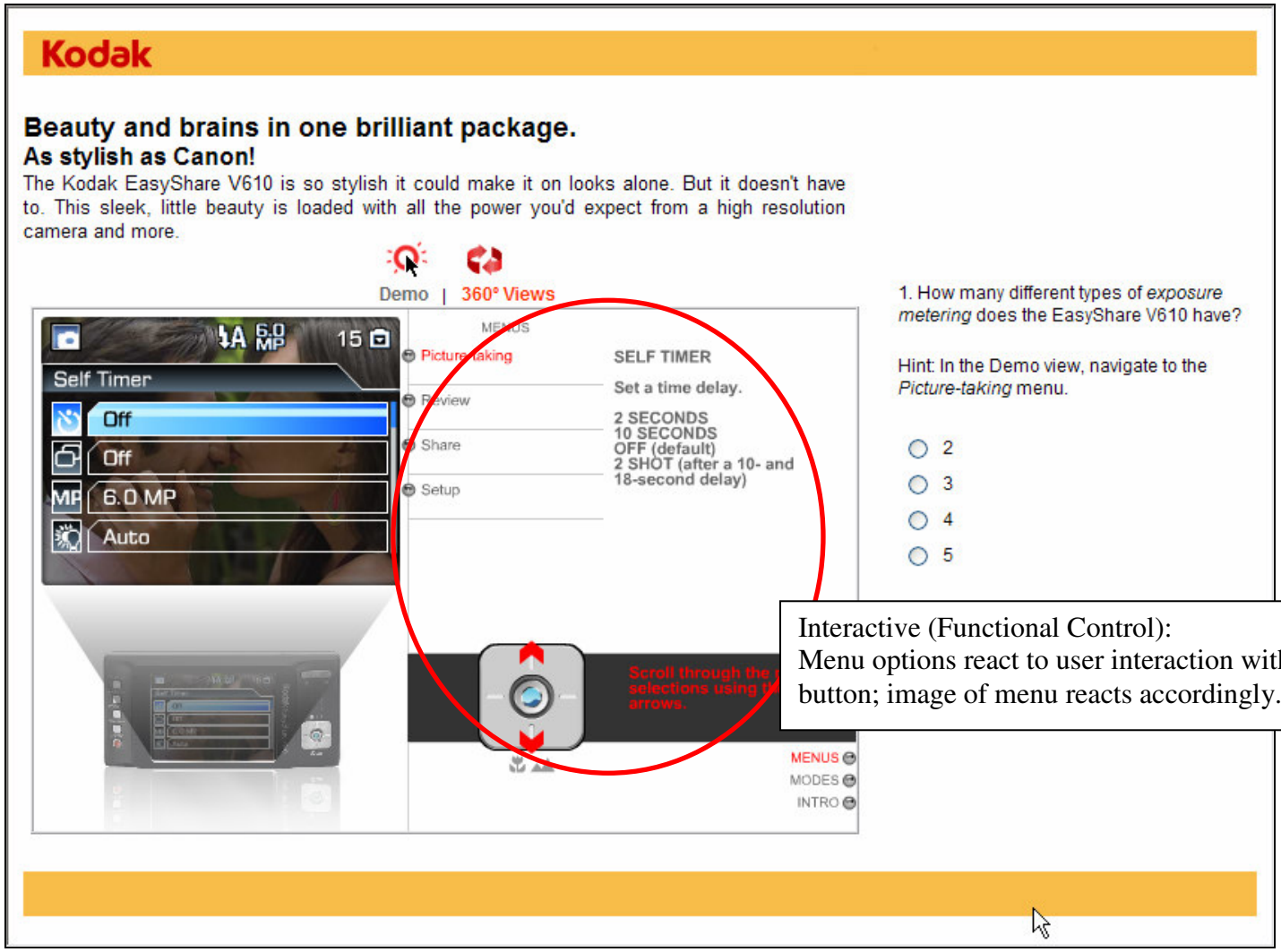
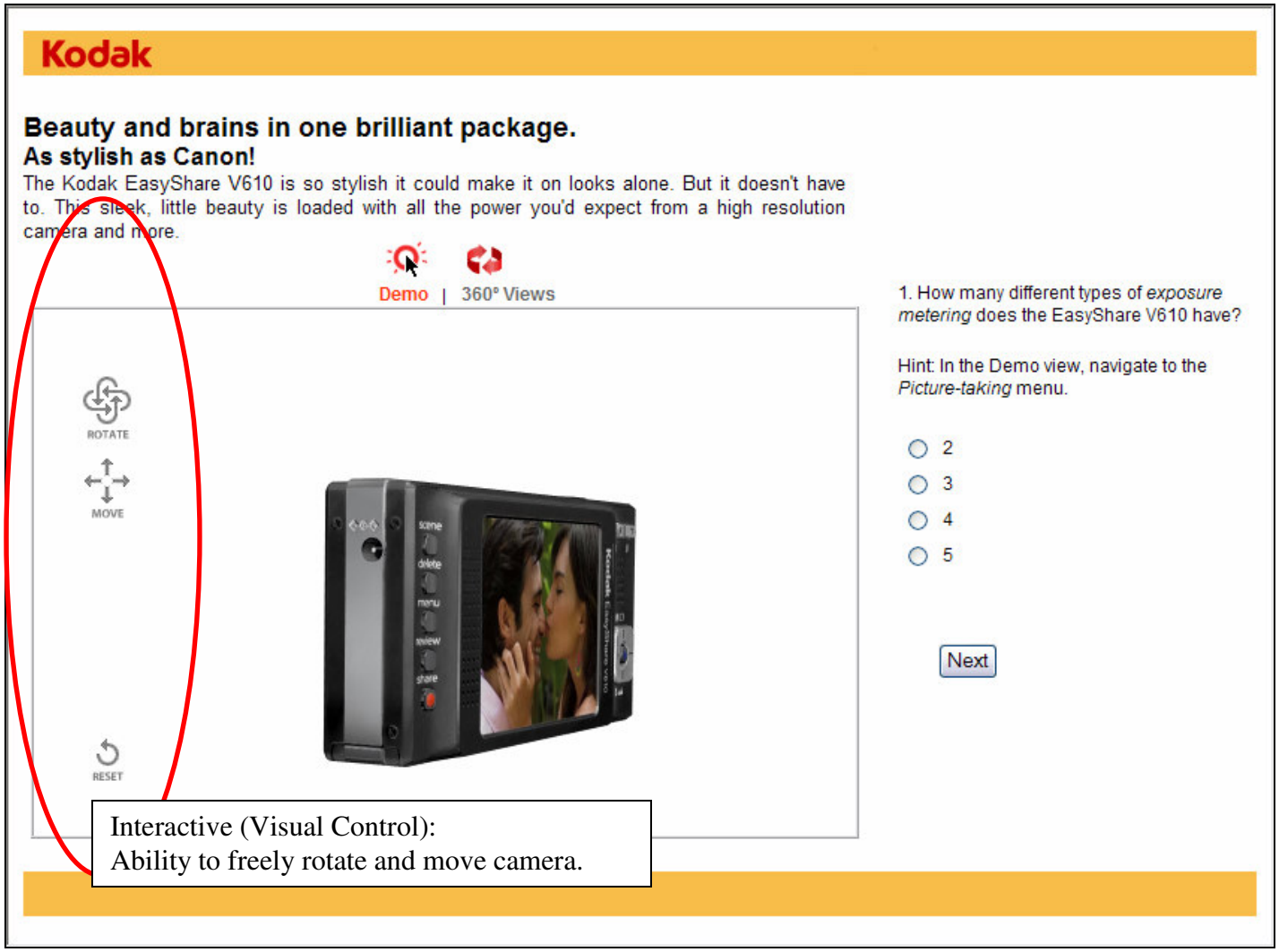


Figure B - 5 - Interactivity Manipulation (Visual Control), Static Condition

Figure B - 6 - Interactivity Manipulation (Visual Control), Interactive Condition



Appendix C – Covariance Matrix (Study 1)

Covariance Matrix (Study 1)

		PRES9 V15	PRES10 V16	PRES11 V17	PRES13 V19	PRES14 V20
PRES9	V15	1.188				
PRES10	V16	.807	1.163			
PRES11	V17	.845	.837	1.426		
PRES13	V19	.863	.751	.794	1.190	
PRES14	V20	.798	.767	.890	.822	1.414
PRES15	V21	.734	.740	.790	.694	.778
PRES18	V24	.737	.627	.707	.733	.693
PRES25	V31	.673	.669	.722	.620	.680
FEEL1	V40	.439	.631	.595	.451	.615
FEEL2	V41	.549	.698	.514	.509	.594
FEEL3	V42	.391	.565	.579	.485	.554
FEEL4	V43	.387	.538	.556	.346	.597
FEEL5	V44	.273	.273	.374	.300	.404
FEEL6	V45	.453	.575	.611	.439	.474
FEEL7	V46	.227	.047	.354	.111	.372
FEEL8	V47	.331	.294	.494	.175	.522
FEEL9	V48	.152	.244	.316	.316	.299
FEEL10	V49	.329	.402	.317	.402	.321
FEEL11	V50	.386	.290	.473	.387	.368
FEEL12	V51	.419	.570	.558	.355	.634
ATTGP1	V92	.214	.270	.353	.260	.277
ATTGP2	V93	.209	.271	.334	.230	.278
ATTGP3	V94	.186	.242	.370	.233	.254
INTP1	V98	.183	.386	.488	.169	.357
INTP2	V99	.134	.301	.416	.071	.217
INTP3	V100	.350	.616	.663	.300	.460
INTP4	V101	.206	.313	.316	.177	.234
INTER1	V151	.234	.402	.402	.036	.346
INTER2	V152	.205	.500	.388	.169	.227
INTER3	V153	.117	.367	.502	.058	.128
INTER4	V154	.362	.465	.468	.315	.353
EOU_T1	V159	3.266	3.175	3.027	4.176	3.318
EOU_T2	V160	3.273	3.213	3.170	4.214	3.178
EOU_T3	V161	2.774	2.864	2.579	3.800	2.753
EOU_T4	V162	2.279	2.812	3.711	3.456	3.078
EOU_T5	V163	3.105	3.726	3.699	4.631	3.765
EOU_T6	V164	2.616	3.240	3.327	3.949	2.434
SHAPE_T1	V165	3.345	2.100	3.268	2.986	2.598
SHAPE_T2	V166	3.280	3.573	4.227	3.491	3.147
SHAPE_T3	V167	3.408	3.853	4.416	4.052	3.248
QUAL_T1	V168	1.705	2.497	2.101	2.506	1.425
QUAL_T2	V169	1.383	2.279	2.967	1.844	1.018
QUAL_T3	V170	1.575	2.432	2.982	2.510	1.852
QUAL_T4	V171	1.765	2.556	3.612	2.198	2.004
QUAL_T5	V172	2.566	2.026	2.455	2.840	1.171

		PRES15	PRES18	PRES25	FEEL1	FEEL2
		V21	V24	V31	V40	V41
PRES15	V21	1.242				
PRES18	V24	.736	1.363			
PRES25	V31	.744	.754	1.100		
FEEL1	V40	.657	.620	.680	2.577	
FEEL2	V41	.569	.592	.652	2.146	3.429
FEEL3	V42	.663	.542	.584	2.009	2.252
FEEL4	V43	.565	.432	.560	1.486	1.647
FEEL5	V44	.352	.308	.344	1.332	1.807
FEEL6	V45	.581	.488	.553	1.462	2.105
FEEL7	V46	.432	.294	.308	.780	.974
FEEL8	V47	.597	.166	.294	1.148	1.529
FEEL9	V48	.320	.120	.207	.658	1.156
FEEL10	V49	.460	.294	.386	.774	1.168
FEEL11	V50	.427	.301	.315	1.034	1.306
FEEL12	V51	.529	.496	.482	1.329	1.913
ATTGP1	V92	.233	.344	.273	.651	.664
ATTGP2	V93	.261	.322	.316	.717	.638
ATTGP3	V94	.264	.286	.260	.618	.605
INTP1	V98	.337	.358	.329	1.014	1.078
INTP2	V99	.239	.420	.315	.975	1.029
INTP3	V100	.565	.522	.583	.946	1.117
INTP4	V101	.252	.433	.234	.863	.977
INTER1	V151	.305	.523	.234	.538	.666
INTER2	V152	.482	.378	.182	.687	.526
INTER3	V153	.362	.429	.335	.633	.509
INTER4	V154	.375	.496	.372	.578	.561
EOU_T1	V159	2.238	2.827	2.398	4.739	5.130
EOU_T2	V160	2.068	2.924	2.016	4.455	5.522
EOU_T3	V161	2.409	2.564	1.933	4.455	5.736
EOU_T4	V162	2.522	3.534	3.058	5.774	6.731
EOU_T5	V163	3.128	3.324	2.835	5.643	6.075
EOU_T6	V164	2.297	2.861	2.279	4.491	5.820
SHAPE_T1	V165	2.729	2.592	2.967	5.987	5.468
SHAPE_T2	V166	3.210	2.560	2.822	5.108	6.169
SHAPE_T3	V167	3.433	3.062	3.437	4.735	5.653
QUAL_T1	V168	2.051	1.761	1.505	5.962	6.692
QUAL_T2	V169	1.769	2.379	1.683	4.497	4.934
QUAL_T3	V170	1.699	2.320	1.669	5.397	5.847
QUAL_T4	V171	2.275	1.489	1.712	4.848	4.801
QUAL_T5	V172	1.663	1.732	2.365	4.564	4.216

		FEEL3	FEEL4	FEEL5	FEEL6	FEEL7
		V42	V43	V44	V45	V46
FEEL3	V42	2.743				
FEEL4	V43	1.715	2.331			
FEEL5	V44	1.340	.889	2.328		
FEEL6	V45	1.553	1.012	1.305	3.394	
FEEL7	V46	.760	.597	.433	.316	4.647
FEEL8	V47	1.179	.832	1.259	1.022	2.235
FEEL9	V48	.857	.447	.944	.987	1.001
FEEL10	V49	.800	.465	.853	1.052	.891
FEEL11	V50	1.116	.639	.849	1.602	1.279
FEEL12	V51	1.495	.951	1.294	1.330	1.497
ATTGP1	V92	.634	.512	.464	.545	.355
ATTGP2	V93	.687	.628	.509	.479	.295
ATTGP3	V94	.634	.525	.439	.424	.297
INTP1	V98	.896	.910	.889	.783	.594
INTP2	V99	.966	.726	.721	.771	.547
INTP3	V100	.883	.846	.576	.853	.535
INTP4	V101	.937	.723	.477	.521	.520
INTER1	V151	.347	.462	.438	.250	.087
INTER2	V152	.403	.577	.419	.402	-.258
INTER3	V153	.422	.401	.487	.513	.096
INTER4	V154	.462	.387	.078	.449	.207
EOU_T1	V159	4.381	3.487	3.437	3.867	-.334
EOU_T2	V160	4.754	3.298	3.929	4.631	-.726
EOU_T3	V161	4.733	3.600	3.685	5.351	.262
EOU_T4	V162	6.158	4.630	5.029	5.237	1.140
EOU_T5	V163	5.294	3.652	4.143	4.707	.136
EOU_T6	V164	4.860	3.840	4.429	4.756	-.206
SHAPE_T1	V165	6.402	4.994	2.512	6.056	2.469
SHAPE_T2	V166	5.685	5.495	3.366	6.414	1.053
SHAPE_T3	V167	4.604	5.078	4.508	5.677	.061
QUAL_T1	V168	5.716	5.531	5.372	5.417	2.809
QUAL_T2	V169	4.468	4.767	3.527	3.670	2.065
QUAL_T3	V170	5.146	4.861	4.204	4.373	2.517
QUAL_T4	V171	4.522	3.814	4.912	4.132	1.978
QUAL_T5	V172	4.051	4.135	3.908	3.368	.232

		FEEL8	FEEL9	FEEL10	FEEL11	FEEL12
		V47	V48	V49	V50	V51
FEEL8	V47	4.353				
FEEL9	V48	1.827	2.375			
FEEL10	V49	1.453	1.667	2.417		
FEEL11	V50	1.915	1.561	1.710	3.971	
FEEL12	V51	2.030	1.665	1.753	2.066	3.597
ATTGP1	V92	.231	.177	.065	.106	.258
ATTGP2	V93	.246	.105	.099	.068	.307
ATTGP3	V94	.204	.152	.030	.168	.238
INTP1	V98	1.097	.623	.521	.691	.874
INTP2	V99	.866	.628	.558	.857	.870
INTP3	V100	.710	.623	.607	.595	.924
INTP4	V101	.820	.370	.464	.501	.767
INTER1	V151	.112	.041	.050	.068	.442
INTER2	V152	.245	.153	.329	.396	.283
INTER3	V153	.169	.339	.320	.239	.584
INTER4	V154	-.089	.107	.233	.275	.390
EOU_T1	V159	-.075	1.368	1.071	1.687	2.658
EOU_T2	V160	.191	1.673	1.480	1.293	3.668
EOU_T3	V161	.915	1.912	2.238	2.658	4.012
EOU_T4	V162	.962	1.537	.943	1.881	4.008
EOU_T5	V163	-.132	.588	.866	1.191	2.763
EOU_T6	V164	-.233	.316	.315	.643	1.803
SHAPE_T1	V165	-.628	.454	.641	2.244	1.117
SHAPE_T2	V166	1.298	1.087	2.439	2.769	2.124
SHAPE_T3	V167	.453	1.214	2.274	2.074	2.352
QUAL_T1	V168	4.018	3.428	2.748	3.054	4.539
QUAL_T2	V169	2.635	2.530	2.302	1.893	3.865
QUAL_T3	V170	2.930	2.989	2.805	2.476	4.420
QUAL_T4	V171	4.869	3.364	3.039	2.292	3.975
QUAL_T5	V172	-.119	2.895	2.272	1.980	2.600

		ATTGP1 V92	ATTGP2 V93	ATTGP3 V94	INTP1 V98	INTP2 V99
ATTGP1	V92	1.012				
ATTGP2	V93	.829	1.067			
ATTGP3	V94	.832	.858	.958		
INTP1	V98	.767	.791	.731	3.188	
INTP2	V99	.691	.736	.681	2.307	2.947
INTP3	V100	.778	.855	.779	1.889	2.163
INTP4	V101	.702	.754	.646	1.435	1.684
INTER1	V151	.650	.504	.492	.585	.672
INTER2	V152	.349	.287	.354	.505	.531
INTER3	V153	.358	.310	.273	.843	.911
INTER4	V154	.427	.421	.392	.460	.654
EOU_T1	V159	3.875	3.485	3.454	2.453	2.505
EOU_T2	V160	3.034	3.036	2.717	2.841	3.576
EOU_T3	V161	3.649	3.156	2.988	3.909	3.752
EOU_T4	V162	4.072	3.796	3.947	4.184	3.769
EOU_T5	V163	3.495	3.181	3.452	3.971	3.037
EOU_T6	V164	3.214	3.292	3.316	3.610	2.953
SHAPE_T1	V165	4.004	5.075	4.131	3.851	3.728
SHAPE_T2	V166	4.758	4.606	4.301	7.051	6.390
SHAPE_T3	V167	4.687	4.636	4.391	5.753	5.303
QUAL_T1	V168	5.097	5.462	4.811	9.339	8.897
QUAL_T2	V169	5.046	5.336	4.553	8.147	9.407
QUAL_T3	V170	5.120	5.041	4.530	8.025	8.902
QUAL_T4	V171	3.731	4.348	3.961	6.615	6.673
QUAL_T5	V172	4.257	5.188	4.412	5.514	7.239

		INTP3 V100	INTP4 V101	INTER1 V151	INTER2 V152	INTER3 V153
INTP3	V100	2.936				
INTP4	V101	1.769	2.160			
INTER1	V151	.798	.693	5.197		
INTER2	V152	.472	.320	2.784	4.219	
INTER3	V153	.796	.589	2.651	2.208	3.899
INTER4	V154	.808	.571	1.765	1.413	1.653
EOU_T1	V159	4.315	3.174	1.921	.159	1.945
EOU_T2	V160	4.650	3.277	2.328	.623	2.970
EOU_T3	V161	4.671	2.974	2.076	.913	2.581
EOU_T4	V162	4.797	2.627	3.410	2.676	3.184
EOU_T5	V163	4.551	2.514	2.060	2.198	2.104
EOU_T6	V164	4.227	3.235	4.101	2.585	3.212
SHAPE_T1	V165	5.111	4.581	.609	2.301	1.017
SHAPE_T2	V166	7.869	6.179	3.395	2.729	3.529
SHAPE_T3	V167	7.143	4.600	3.813	4.364	3.580
QUAL_T1	V168	10.303	8.523	2.729	1.266	4.380
QUAL_T2	V169	10.663	8.331	4.426	2.375	5.282
QUAL_T3	V170	10.683	8.675	3.540	1.514	5.122
QUAL_T4	V171	7.802	5.738	2.806	1.580	5.373
QUAL_T5	V172	8.418	5.581	2.475	1.537	2.984

		INTER4	EOU_T1	EOU_T2	EOU_T3	EOU_T4
		V154	V159	V160	V161	V162
INTER4	V154	2.158				
EOU_T1	V159	4.471	131.358			
EOU_T2	V160	4.904	105.889	120.765		
EOU_T3	V161	4.165	100.666	103.368	119.557	
EOU_T4	V162	4.281	88.818	83.738	91.796	118.184
EOU_T5	V163	4.350	94.218	85.371	91.833	93.081
EOU_T6	V164	4.622	99.355	89.036	94.353	97.462
SHAPE_T1	V165	5.045	43.352	37.863	35.438	38.783
SHAPE_T2	V166	4.540	55.564	51.300	56.905	58.910
SHAPE_T3	V167	4.896	65.486	58.453	63.278	67.483
QUAL_T1	V168	3.317	56.066	52.494	55.160	55.275
QUAL_T2	V169	4.357	46.703	46.907	47.984	47.706
QUAL_T3	V170	4.624	51.345	51.091	52.128	51.199
QUAL_T4	V171	2.989	39.390	45.109	48.474	48.155
QUAL_T5	V172	4.070	38.931	41.555	44.561	43.554

		EOU_T5	EOU_T6	SHAPE_T1	SHAPE_T2	SHAPE_T3
		V163	V164	V165	V166	V167
EOU_T5	V163	119.614				
EOU_T6	V164	104.736	130.875			
SHAPE_T1	V165	36.537	40.554	190.137		
SHAPE_T2	V166	57.815	53.968	88.514	139.714	
SHAPE_T3	V167	67.976	66.371	76.647	117.365	142.367
QUAL_T1	V168	54.562	53.847	43.427	64.314	64.703
QUAL_T2	V169	41.954	45.635	35.315	50.888	56.611
QUAL_T3	V170	46.523	45.996	37.831	56.953	58.039
QUAL_T4	V171	44.080	41.342	25.978	41.609	45.450
QUAL_T5	V172	43.162	44.154	71.011	56.585	56.697

		QUAL_T1	QUAL_T2	QUAL_T3	QUAL_T4	QUAL_T5
		V168	V169	V170	V171	V172
QUAL_T1	V168	140.725				
QUAL_T2	V169	109.804	136.102			
QUAL_T3	V170	111.910	120.230	133.897		
QUAL_T4	V171	83.035	88.022	93.885	123.355	
QUAL_T5	V172	80.984	77.318	83.322	76.383	170.561

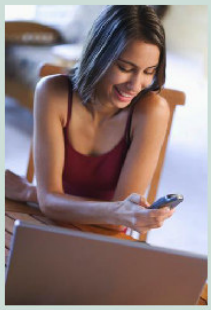
Appendix D – Interfaces (Study 2)

Figure D - 1 - Study 2: Utilitarian/Interactive

Figure D - 2 - Study 2: Hedonic/Static

Motorola MOTOKRZR K1

Because Life Should Be Fun



Because Life should be fun. Grab the stylish MotoKRZR K1, select your music and head for the action; you've got everything you need to meet up with friends for an exciting night out.

Never miss a moment. A fun moment at a party. Your puppy chasing its tail then falling over. Use your shots to keep in touch. Goodbye boredom: Enjoy life and share your exciting moments with friends with the MotoKRZR K1.

Appendix E – Covariance Matrix (Study 2)

Covariance Matrix (Study 2)

		PRES9	PRES10	PRES11	PRES13	PRES14
		V15	V16	V17	V19	V20
PRES9	V15	1.383				
PRES10	V16	.581	1.100			
PRES11	V17	.694	.583	1.373		
PRES13	V19	.558	.527	.477	1.093	
PRES14	V20	.736	.574	.650	.504	1.114
PRES15	V21	.472	.507	.739	.461	.588
PRES18	V24	.890	.483	.718	.497	.639
PRES25	V31	.782	.557	.741	.477	.643
FEEL1	V40	.403	.541	.457	.467	.338
FEEL2	V41	.734	.864	.698	.629	.535
FEEL3	V42	.878	.912	.839	.560	.704
FEEL4	V43	.676	.623	.608	.487	.579
FEEL5	V44	.507	.406	.537	.354	.366
FEEL6	V45	.732	.622	.762	.501	.711
FEEL7	V46	.402	.346	.588	.154	.423
FEEL8	V47	.424	.383	.610	.239	.420
FEEL9	V48	.232	.050	.490	.224	.227
FEEL10	V49	.381	.231	.510	.282	.365
FEEL11	V50	.436	.350	.432	.309	.407
FEEL12	V51	.518	.327	.514	.466	.465
ATTGP1	V92	.274	.399	.327	.258	.220
ATTGP2	V93	.282	.342	.302	.233	.256
ATTGP3	V94	.297	.388	.291	.243	.249
INTP1	V98	.263	.454	.548	.153	.579
INTP2	V99	.202	.369	.388	.129	.404
INTP3	V100	.258	.418	.562	.209	.450
INTP4	V101	.354	.568	.547	.373	.510
INTER1	V151	.447	.418	.677	.154	.428
INTER2	V152	.588	.528	.769	.207	.535
INTER3	V153	.307	.441	.853	-.027	.311
INTER4	V154	.691	.559	.760	.275	.665
EOU_T1	V159	2.539	2.360	2.218	2.229	2.875
EOU_T2	V160	2.643	2.274	2.199	1.800	2.194
EOU_T3	V161	3.066	2.893	3.434	3.101	2.952
EOU_T4	V162	3.074	2.515	4.069	2.640	3.051
EOU_T5	V163	3.257	2.516	2.600	2.641	3.198
EOU_T6	V164	3.019	3.222	2.994	2.707	3.606
SHAPE_T2	V166	3.757	3.900	2.286	2.101	2.996
SHAPE_T3	V167	2.409	2.783	1.023	1.845	2.426
QUAL_T1	V168	2.133	3.834	3.644	2.824	3.563
QUAL_T2	V169	1.842	3.751	2.957	2.184	1.803
QUAL_T3	V170	1.720	3.815	3.613	2.344	2.705
QUAL_T4	V171	1.947	2.952	3.377	2.204	2.983
QUAL_T5	V172	1.531	2.266	1.242	2.342	.427
POS	V220	-.004	-.003	.000	.034	-.003

		PRES15	PRES18	PRES25	FEEL1	FEEL2
		V21	V24	V31	V40	V41
PRES15	V21	1.288				
PRES18	V24	.439	1.469			
PRES25	V31	.644	.992	1.438		
FEEL1	V40	.527	.463	.556	2.918	
FEEL2	V41	.673	.637	.591	2.306	3.765
FEEL3	V42	.746	.691	.713	2.340	2.929
FEEL4	V43	.576	.575	.485	1.830	2.345
FEEL5	V44	.484	.471	.564	1.817	1.891
FEEL6	V45	.762	.546	.597	2.398	2.820
FEEL7	V46	.587	.393	.544	1.069	.883
FEEL8	V47	.653	.439	.581	1.372	1.708
FEEL9	V48	.378	.225	.269	.785	1.118
FEEL10	V49	.321	.378	.413	.826	1.273
FEEL11	V50	.212	.436	.184	1.636	2.018
FEEL12	V51	.623	.479	.670	1.259	1.697
ATTGP1	V92	.286	.396	.321	.628	.865
ATTGP2	V93	.295	.383	.295	.758	.922
ATTGP3	V94	.323	.483	.389	.747	.912
INTP1	V98	.635	.524	.721	.975	1.343
INTP2	V99	.501	.367	.465	1.020	1.360
INTP3	V100	.469	.512	.541	.867	1.297
INTP4	V101	.521	.513	.532	1.007	1.223
INTER1	V151	.577	.810	.868	.500	.559
INTER2	V152	.479	.785	.726	.626	1.012
INTER3	V153	.585	.451	.578	.561	1.001
INTER4	V154	.600	.921	.846	.654	1.018
EOU_T1	V159	1.162	3.726	4.148	3.412	4.269
EOU_T2	V160	.346	3.802	4.080	3.653	5.160
EOU_T3	V161	1.270	4.014	4.022	4.164	6.033
EOU_T4	V162	2.406	3.582	4.472	6.054	8.087
EOU_T5	V163	1.494	3.677	4.079	4.089	4.258
EOU_T6	V164	1.799	4.038	4.639	3.579	5.890
SHAPE_T2	V166	1.900	3.714	4.084	5.582	7.062
SHAPE_T3	V167	2.871	2.824	2.628	5.055	7.142
QUAL_T1	V168	4.100	3.296	2.356	6.753	6.882
QUAL_T2	V169	2.797	3.247	1.647	6.749	6.499
QUAL_T3	V170	3.402	3.499	2.153	6.767	6.274
QUAL_T4	V171	3.438	3.212	2.344	6.392	5.948
QUAL_T5	V172	.584	2.835	1.837	6.283	5.373
POS	V220	.068	.054	.075	-.066	-.043

		FEEL3	FEEL4	FEEL5	FEEL6	FEEL7
		V42	V43	V44	V45	V46
FEEL3	V42	3.652				
FEEL4	V43	2.427	3.056			
FEEL5	V44	2.060	1.792	2.578		
FEEL6	V45	3.125	2.381	2.079	4.669	
FEEL7	V46	1.149	.947	.532	1.267	3.886
FEEL8	V47	1.839	1.408	1.548	1.911	2.216
FEEL9	V48	1.191	.875	.881	1.500	.917
FEEL10	V49	1.208	1.075	.974	1.461	1.150
FEEL11	V50	1.778	1.876	1.309	2.111	1.288
FEEL12	V51	1.601	1.327	1.339	1.932	1.940
ATTGP1	V92	.691	.486	.559	.689	.211
ATTGP2	V93	.799	.613	.669	.729	.186
ATTGP3	V94	.866	.660	.735	.810	.170
INTP1	V98	1.248	.900	.786	1.018	.587
INTP2	V99	1.188	1.006	1.084	1.163	.234
INTP3	V100	.999	.907	.996	.953	.467
INTP4	V101	1.185	.948	.900	.934	.580
INTER1	V151	.409	.153	.377	.437	.540
INTER2	V152	.862	.350	.666	.824	.550
INTER3	V153	.776	.531	.696	.481	.660
INTER4	V154	1.053	.660	.610	.875	.694
EOU_T1	V159	4.416	2.730	2.816	3.649	.201
EOU_T2	V160	4.965	3.659	3.083	4.516	.740
EOU_T3	V161	5.715	3.973	3.506	5.045	.365
EOU_T4	V162	7.165	5.114	4.771	8.065	2.088
EOU_T5	V163	4.650	3.801	3.439	2.849	.356
EOU_T6	V164	5.975	4.623	4.508	4.283	2.034
SHAPE_T2	V166	7.143	4.521	4.350	6.415	2.226
SHAPE_T3	V167	6.602	5.700	3.832	6.795	3.645
QUAL_T1	V168	5.811	6.044	5.765	8.794	5.630
QUAL_T2	V169	6.166	4.526	5.180	6.816	3.379
QUAL_T3	V170	5.237	5.014	5.076	7.326	5.318
QUAL_T4	V171	6.126	5.105	5.256	6.608	5.886
QUAL_T5	V172	4.173	3.011	4.434	5.578	1.588
POS	V220	-.109	-.010	-.039	-.069	.063

		FEEL8	FEEL9	FEEL10	FEEL11	FEEL12
		V47	V48	V49	V50	V51
FEEL8	V47	4.577				
FEEL9	V48	1.716	2.484			
FEEL10	V49	1.794	1.675	2.402		
FEEL11	V50	2.083	1.404	1.867	4.324	
FEEL12	V51	3.321	1.784	1.835	1.945	4.267
ATTGP1	V92	.427	.197	.229	.496	.370
ATTGP2	V93	.427	.158	.256	.387	.331
ATTGP3	V94	.350	.103	.281	.298	.293
INTP1	V98	1.144	.405	.519	.783	.940
INTP2	V99	.906	.371	.462	.816	.799
INTP3	V100	.863	.349	.513	.766	.744
INTP4	V101	.881	.332	.470	.892	.696
INTER1	V151	.982	.540	.195	-.324	.682
INTER2	V152	1.375	.685	.412	.100	.850
INTER3	V153	1.341	.692	.631	.373	.769
INTER4	V154	1.309	.756	.563	.539	.930
EOU_T1	V159	-.152	1.487	1.373	-.597	1.968
EOU_T2	V160	1.131	2.544	1.884	.506	1.761
EOU_T3	V161	.481	1.704	1.526	.690	1.930
EOU_T4	V162	2.612	4.648	3.379	2.329	4.443
EOU_T5	V163	1.479	2.102	1.977	-.209	1.584
EOU_T6	V164	3.707	2.376	2.731	1.152	3.001
SHAPE_T2	V166	5.267	4.375	4.451	3.340	4.783
SHAPE_T3	V167	5.705	4.172	3.436	4.209	5.656
QUAL_T1	V168	7.564	4.690	4.531	8.219	5.947
QUAL_T2	V169	7.006	2.629	3.211	7.640	4.496
QUAL_T3	V170	8.405	3.735	4.350	8.402	5.613
QUAL_T4	V171	9.388	4.397	4.321	7.465	6.166
QUAL_T5	V172	4.919	1.846	2.017	5.683	1.871
POS	V220	.069	-.030	.024	-.041	.030

		ATTGP1	ATTGP2	ATTGP3	INTP1	INTP2
		V92	V93	V94	V98	V99
ATTGP1	V92	1.353				
ATTGP2	V93	1.127	1.550			
ATTGP3	V94	1.100	1.264	1.433		
INTP1	V98	.988	.905	.841	3.327	
INTP2	V99	.813	.891	.836	2.271	2.670
INTP3	V100	.971	.980	.891	2.122	2.032
INTP4	V101	.961	1.081	.956	1.563	1.448
INTER1	V151	.585	.532	.541	.992	.695
INTER2	V152	.452	.443	.446	1.072	.731
INTER3	V153	.387	.372	.282	1.239	1.016
INTER4	V154	.588	.506	.494	1.075	.880
EOU_T1	V159	5.549	6.303	6.362	4.915	3.485
EOU_T2	V160	5.414	6.595	6.552	4.787	4.616
EOU_T3	V161	5.769	6.303	6.582	4.517	3.895
EOU_T4	V162	6.051	6.741	6.275	6.504	5.756
EOU_T5	V163	5.352	5.857	6.476	5.301	4.342
EOU_T6	V164	5.893	6.100	6.718	6.092	4.452
SHAPE_T2	V166	6.361	7.591	7.107	6.000	4.470
SHAPE_T3	V167	6.593	7.335	7.044	6.364	5.317
QUAL_T1	V168	6.509	7.039	6.299	7.206	7.243
QUAL_T2	V169	6.887	7.083	6.593	5.715	5.958
QUAL_T3	V170	5.883	6.055	5.269	5.846	5.921
QUAL_T4	V171	4.119	4.218	4.069	5.725	5.030
QUAL_T5	V172	4.590	4.027	3.604	.897	.714
POS	V220	.081	.079	.064	.117	.066

		INTP3	INTP4	INTER1	INTER2	INTER3
		V100	V101	V151	V152	V153
INTP3	V100	2.894				
INTP4	V101	1.849	2.213			
INTER1	V151	.551	.678	4.383		
INTER2	V152	.665	.580	3.269	4.290	
INTER3	V153	.830	.689	2.703	2.898	4.059
INTER4	V154	.820	.774	2.399	2.640	2.458
EOU_T1	V159	5.942	6.762	6.109	7.403	5.045
EOU_T2	V160	5.071	6.509	8.004	8.305	5.965
EOU_T3	V161	5.877	7.119	6.829	7.582	5.510
EOU_T4	V162	6.440	7.094	7.937	8.228	7.866
EOU_T5	V163	5.621	6.395	6.003	5.882	4.466
EOU_T6	V164	7.358	7.699	5.998	7.077	6.830
SHAPE_T2	V166	5.309	6.566	8.275	6.516	4.464
SHAPE_T3	V167	5.461	6.743	6.305	4.725	2.743
QUAL_T1	V168	8.120	8.979	6.287	5.860	5.163
QUAL_T2	V169	6.446	8.048	2.926	3.657	3.345
QUAL_T3	V170	6.046	7.499	4.777	4.892	4.299
QUAL_T4	V171	4.807	6.478	5.835	5.249	5.901
QUAL_T5	V172	3.504	4.165	1.699	3.947	1.335
POS	V220	.047	.075	.160	.044	.076

		INTER4	EOU_T1	EOU_T2	EOU_T3	EOU_T4
		V154	V159	V160	V161	V162
INTER4	V154	3.108				
EOU_T1	V159	5.853	200.461			
EOU_T2	V160	7.043	163.496	182.319		
EOU_T3	V161	6.501	166.452	158.095	181.487	
EOU_T4	V162	8.031	150.920	151.063	145.064	180.363
EOU_T5	V163	5.543	165.991	160.264	155.961	143.797
EOU_T6	V164	7.148	172.596	159.585	157.971	142.511
SHAPE_T2	V166	6.385	69.488	75.967	65.070	76.387
SHAPE_T3	V167	5.687	84.071	86.970	75.480	86.440
QUAL_T1	V168	6.225	73.473	75.951	81.245	83.886
QUAL_T2	V169	4.340	55.907	58.848	69.133	63.869
QUAL_T3	V170	4.580	63.808	66.349	71.618	74.672
QUAL_T4	V171	5.339	52.664	60.995	63.666	64.770
QUAL_T5	V172	3.555	34.225	39.329	40.108	40.888
POS	V220	.088	-.048	.185	.256	.307

		EOU_T5	EOU_T6	SHAPE_T2	SHAPE_T3	QUAL_T1
		V163	V164	V166	V167	V168
EOU_T5	V163	193.857				
EOU_T6	V164	166.791	201.932			
SHAPE_T2	V166	81.830	77.945	166.684		
SHAPE_T3	V167	90.898	88.370	127.252	163.445	
QUAL_T1	V168	74.242	88.623	75.769	82.805	165.125
QUAL_T2	V169	58.988	73.461	75.499	77.614	126.636
QUAL_T3	V170	69.412	79.609	71.161	77.604	137.086
QUAL_T4	V171	66.223	73.930	70.770	70.751	109.243
QUAL_T5	V172	33.136	42.564	39.667	44.933	68.485
POS	V220	.050	-.168	.797	.639	.462

		QUAL_T2	QUAL_T3	QUAL_T4	QUAL_T5	POS
		V169	V170	V171	V172	V220
QUAL_T2	V169	151.484				
QUAL_T3	V170	130.215	154.267			
QUAL_T4	V171	104.676	117.215	151.148		
QUAL_T5	V172	70.261	71.889	56.000	132.876	
POS	V220	.604	.509	.907	-.227	.251