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Impact of Telepresence on Consumer Learning: A Consumer Information Processing Approach

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Abstract

Based on the communication literature, telepresence is defined as "a mediated experience that creates for the user a strong sense of presence and entails an illusion of non-mediation". The main body of previous studies serves industrial communication where technology is of vital concern. However, in the context of e-commerce, the appropriate focus of telepresence should be the human experience rather than the technology. Therefore, it is pertinent to discuss the impact of telepresence on consumer cognitive responses and activities. Consumer learning plays an important role in consumer purchase decision. Helping consumers learn has been proven to be an efficient marketing communication goal and lead to the long-term profit performance. Note that consumer information processing theory lies at the heart of a wide range of consumer cognitive activities including consumer learning. We intend to investigate the concept of telepresence in e-commerce context, and integrate consumer information processing theory around the concept of telepresence to explore its impact on consumer learning.

Keywords: Telepresence, Consumer Learning, Consumer Information Processing, Visual Search Theory, Multiple Resource Capacity Theory, ELM

1. Introduction

Consumers are conducting a substantial and rapidly increasing amount of business on the Internet. According to the business research firm eMarketer, business-to-consumer electronic commerce is projected to reach $133 billion by 2005. Furthermore, a higher percentage of web surfers have become more comfortable with the concept of online shopping, and 142 million consumers or 65% of the online population will have made a purchase online by 2007.

Factors that make an e-commerce website successful are always of vital concern to researchers and marketers. With the rapid development of information technologies, telepresence – "a mediated experience that creates for the user a strong sense of presence and entails an illusion of non-mediation" (Lombard and Ditton 1997) – is now arousing more and more attention from both academia and practice. Researchers posit that telepresence may induce positive cognitive feelings (arousal, affect, enjoyment, etc.), and may have positive impact on memory, persuasion, task performance, and consumer learning, etc (Lombard and Ditton 1997; Kim and Biocca 1997; Novak and Hoffman 1997; Regenbrecht et al. 1998; Shih 1998; Li et al. 2001, 2002; Grigorovici 2003).

Consumer learning is "the process by which individuals acquire the purchase and consumption knowledge and experience that they apply to future related behavior" (Schiffman and Kanuk 1997). Note that consumer learning plays an important role in

consumer purchase decision. Marketing success can depend on how well marketers are able to develop and adapt information to learning of consumers, as well as finding best ways to communicate to consumers such that learning takes place.

Consumer information processing is one of the central concepts of all cognitive psychology (Lund 2001). It refers to the process through which consumers are exposed to information, attend to it, comprehend it, place it in memory, and retrieve it for later use (Mowen and Minor 1998). Consumer information processing lies at the heart of a wide range of consumer activities, including consumer learning, evaluation, satisfaction, persuasion, and decision making, etc. The perceived sense of telepresence in the virtual environment is also generated from sensory input, mental processes, and past experiences that assimilated together in a current state (Gibson, 1966). Therefore, it seems pertinent to integrate consumer information processing research around the concept of telepresence to investigate its impact on consumer learning.

The next section of this paper summarizes the literature on telepresence and describes how its dimensions and sub-dimensions are conceptualized. Section 3 reviews consumer learning. Section 4 presents theoretical background and develops the propositions. The last section concludes and provides implications.

2. Definitions and Dimensions of Telepresence

The main body of previous research on telepresence adopts an industrial communication perspective, aiming at promoting the sense of presence in remote or simulated worlds to enhance the operator's performance with teleoperation systems. Except a few studies (Kim and Biocca 1997; Li et al. 2001, 2002; Klein 2002) research on telepresence from a consumer learning and persuasion perspective rarely exists, with nearly none adopts a consumer information processing approach.

2.1 Defining Telepresence

The concept of telepresence has long been around since certain areas of the industry started to design remote control systems and industrial robots. The term was coined by Minsky in 1980, and refers to an operator's sense of being somehow physically present at a remote location during the telemanipulation of real objects.

However, the roots of telepresence are not so constrictive. With the increasing and far-ranging applications in various fields, the boundary of telepresence has extended. It could refer to the experience of presence either in a temporally or spatially distant yet real environment (Milgram and Ballantyne 1997), or in a mixed-reality or animated but non-existent virtual world synthesized by a computer (Draper et al. 1998). According to Lombard and Ditton (1997), telepresence is "a mediated experience that creates for the user a strong sense of presence and entails an illusion of non-mediation". In Lombard and Snyder-Duch (2001), this definition was further explicated as "a psychological state or subjective perception in which even though part of or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience".

2.2 Dimensions of Telepresence

O'Brien et al. (1998) state that "we are a member of a social and a physical world". With emerging designs in network technologies seeking to offer more transparent and compelling sense of being in another place, and the illusion of the mediated copresence and accessibility

of other people, telepresence may involve perceptions of both physical presence and social presence within the computer-mediated environments. Physical presence describes the perceptions of the physical or computer-mediated world, and refers to the "sense of being there"; while social presence characteristics the perceptions of the social world, and refers to the sense of being together with other people or entities in a certain context.

To a certain extent, these two kinds of presence can be meaningfully distinguished. A number of factors that are central to induce social presence are unnecessary to establish a sense of physical presence, while a medium that can provide a high degree of physical presence may not be able to facilitate social interaction or exhibit certain social context. However, this does not mean that the two are unrelated. Both social and physical presence share a number of common determinants, such as the immediacy of the interaction. Furthermore, researchers argue that "because we are social beings, a common purpose of physical presence is to increase the sense of social presence" (Biocca et al., 2002). There is evidence that applications such as videoconferencing or shared virtual environments are based on providing a mix of both physical and social components (Lessiter et al. 2001; Ijsselsteijn et al. 2001).

We posit that telepresence in e-commerce context also lies on the combination of both physical and social presence. Shopping in real world is a social activity, which may include the pleasure of browsing, impulse buying, discovering new shops, casual conversation, and planned and unplanned meetings with other people. In the early stage of e-commerce, most of the social activities could not be supported. The relationship consumers establish through online shopping is mainly person to machine relationship. However, the Internet is essentially a social place. With the advancements in network and communication technologies, there is an increased availability in bandwidth and channel capacity; this enhances technology-mediated communication that can support rich social cues. The Internet and virtual environments become increasingly social (Biocca et al., 2002). Researchers further claim that a website should be treated as a valid social actor and the relationship between a website and its visitors should be characterized in much the same way one would characterize an inter-personal relationship (Kumar and Benbasat 2002). Moreover, "the criterion for presence does not consist of simply reproducing the conditions of physical presence but in constructing environments in which actors may function in an ecologically valid way" (Mantovani and Riva 1999), the quality of presence also depends on the capacity to produce a social context in which social actors may communicate and cooperate. Hence, in e-commerce context, the importance of social presence equates that of physical presence. Telepresence is the combination of these two.

2.2.1 Physical Presence

Physical presence characterizes the perceptions of the physical or computer-mediated world. In general, physical presence describes a sense of physical placement in the mediated environment, and interaction with and control over parts of the mediated environment. In most early researches, telepresence is investigated as physical presence. Technological approaches are adopted, which assume telepresence exists and attempt to explain how it is driven by technological factors (Held and Durlach 1992; Sheridan 1992, 1996; Steuer 1992; Zeltzer 1992; Slater and Usoh 1993; Slater et al. 1994; Witmer and Singer 1994; Schloerb 1995).

High-fidelity representations of environments are perceived as being more natural, real, and consequently, less distracting (Lessiter et al. 2001). The naturalness of a virtual

representation (Ijsselsteijn et al. 2000) has been shown to correlate with presence. The development of modern information technology improves the interactivity of an e-commerce website. Online users' interaction with and control over a media system (Hendrix and Barfield 1996) is also found to relate to presence. Although a wide range of factors that spur physical presence have been investigated in considerable empirical researches, they roughly fall into two categories, sensory richness, which refers to the fidelity and richness of sensory information presented, and control richness, which refers the degree of user control.

2.2.1.1 Sensory Richness

Media vary in their ability to carry information (Short et al. 1976; Klein 2002). As the use of modern information and communication technologies continues to expand, the fidelity of information transmitted improves. In Schubert et al.'s (2001) theoretical models, the sense of presence is seen as the outcome or a direct function of immersion. The more inclusive, extensive, surrounding, and vivid the virtual environment is (Slater and Wilbur 1997), or the more similar the transformations in the virtual environment are to those in the real world (Barfield and Hendrix 1995, Bystrom et al. 1999), the higher the degree of presence. Similar factors can be found in many previous studies. Sheridan (1992) proposed that extent of sensory information is a principal determinant of telepresence. With high fidelity of picture, sound or tactile image, the virtual image would be compelling, which means it is difficult to discriminate the virtual from the real (Sheridan 1996). Steuer (1992) employed the concept vividness, which refers to "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". According to Steuer (1992), vividness is a key property of media technologies that influences their ability to induce a sense of presence. Zeltzer (1992) also posited that presence is an index "of the number and fidelity of available sensory input and output channels". Heeter (1992) posits that the "range and intensity of stimuli human senses detect and interpret in perceiving the natural world". Similarly, Zelter (1992) links presence to "a rough, lumped measure of the number and fidelity of available sensory input and output channels" provided by the medium. With the rapid development of new technologies and information technologies, it seems safe to imagine that someday the mediated experiences could be perceptually indistinguishable from the real-world ones.

2.2.1.2 Control Richness

Interactivity has long been discussed by researchers in human-computer interaction field (Williams et al. 1989; Rafaeli 1989; Newhagen and Rafaeli 1996; Ghose and Dou 1998; Hanss 1999; Heeter 2000; Teo et al. 2003). As defined by Williams et al. (1989), interactivity is the degree to which participants in a communication process have control over, and can exchange roles in their mutual discourse. Hoffman and Novak (1996) identify user control as one of the key features of interactivity. "Central to the idea of interactivity is the concept of control, either of elements of the physical world or of information" (Lombard and Snyder-Duch 2001).

Although, the concept of information control has long been noted in the marketing literature (Bettman 1979; Weitz 1978; Wright 1973), only electronic communication has the potential for extremely high levels of information control (Ariely 2000). Considerable empirical studies have shown that user control has positive impact on the sense of telepresence. Steuer (1992) proposed that interactivity - the extent to which users can participate in modifying the form and content of a mediated environment in real time - is another important property of media technologies, besides vividness, that influences their ability to induce a sense of presence. However, interactivity is also stimulus driven, which is determined by the

technological structure of the medium. Sheridan (1992) and Zeltzer (1992) also included similar factors as part of their discussions of presence. Control of sensors and ability to modify environment are two principal determinants of sense of presence in Sheridan's (1992) model, while Zeltzer (1992) utilized autonomy (the degree of human control) and interaction (capability for real-time control) to capture the perceiver's control of his relationship to the computer-mediated environment. In recent studies, researchers tend to focus on the more specific aspects of user control, instead of the vague concept of interactivity (Ariely 2000, Klein 2002). In Klein's (2002) study, user control was used as the operationalization of interactivity, and was found to have significant positive impact on the creation of telepresence. Kristof and Satran (1995) provide a seven-item scale of interactivity according to different levels of user control. In Klein's (2002) study, user control was generalized as control over content and control over form. Personalization can be subsumed under user control, in that the essence of both is transfer control to the user.

2.2.2 Social Presence

Presence is something that is socially negotiated and culturally mediated (Heeter 1992; Mantovani and Riva 1999; O'Brien et al. 1998). Social presence describes the sense as being in a social world, which refers to the sense of being present in a social encounter with other social entities (Biocca 1995). With the increasing ability to facilitate understanding, connection, involvement and interaction among online users, or between online users and computer agents, e-commerce websites are conveying increasing degree of social presence.

Social presence was first conceptualized by Short et al. (1976) as "the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships". It occurs when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is communicating with one or more other people or entities (Lombard and Snyder-Duch 2001). Media vary in the ability to allow a user to establish personal connection with the other users (Short et al. 1976). A higher level of presence in a medium confers the attributes of being more sociable, more personal, more sensitive, and warmer. Rice (1992) argues that social presence is dependent not only on the words involved in the communication but also on the full range of verbal and nonverbal cues, and the communication context. Social realism occurs when part or all of a person's perception fails to accurately acknowledge the role of technology that makes it appear that s/he is in a physical location and environment in which the social characteristics correspond to those of the physical world (Lombard and Snyder-Duch 2001).

A major factor of failure e-commerce websites is ignoring important requirements that result from human, cultural and social factors (Andreou et al. 2002). Shopping is a high involvement activity and entails rich social context. In the traditional retail channel, consumers are used to rely on the expertise of the sales staff at outdoors stores. However, things are quite different for online shopping where customers may not have direct product experience and direct interaction with salesmen or other customers. In-depth product information is critical to ensure that consumers make wiser purchase choices, but is far from enough to bring forth satisfaction, trust, and loyalty. As Heeter (1992) suggests, "people want connection with other people more than any other experience. Placing more than one person in a virtual world may be an easy way to induce a sense of presence…" Mantovani and Riva (1999) define this kind of presence more clearly as "individuals can perceive themselves, objects, and other people not only as situated in an external space but also as immersed in a sociocultural web connecting objects, people, and their interactions." "This cultural web – structured by artifacts both physical and ideal – makes possible communication and

cooperation among different social actors by granting them a common reference grid" (Mantovani and Riva 1999).

Para-social presence was first introduced by Horton and Wohl (1956). It refers to the extent to which a medium facilitates a sense of understanding, connection, involvement and interaction among participating social entities (Kumar and Benbasat 2002). Regarded as a social entity, a website could possess different levels of para-social presence depending on how it is configured and used. A medium that facilitates social or para-social presence should accommodate various interactions with human or non-human others (Biocca et al. 2002), as well as transmit the social symbolic, and nonverbal cues of human communication (Rice 1992). Encouragingly, new generation of technologies are being designed to afford social presence, which is supposed to be a mediator of the effects of other media including attitudes towards the mediated others, the medium itself, persuasion, and illusions of reality (Bailenson 2001; Choi 2000). The major components of social presence are social or para-social interaction and social realism.

2.2.2.1 Social or Para-Social Interaction

With the growing popularity of multi-user implementations and artificial beings (avatars) for virtual reality in recent years, interaction is defined as "an episode or series of episodes of physical actions and reactions of an embodied human with the world, including the environment and objects and beings in the world" (Heeter, 2000). Social interaction refers to interactions with other human, e.g. the ability to chat with other online customers, or to interact with the web assistant. Para-social interaction refers to interactions with non-human others, e.g. embodied conversational agents (Cassell et al. 2000) employed by many websites that act as assistants or guides on websites.

Considerable empirical studies suggest that the ability to interact with human or non-human others while browsing through the website leads to higher level of social presence, and generates richer social context. Aberg and Shahmehri's (2000) posit that when human web assistants are provided, customers feel the atmosphere become more personal, and their trust toward the web shop increases. There is evidence suggesting a significant positive correlation between presence and co-presence (the sense of being together in the virtual world) (Mühlbach et al. 1995; Slater et al 2000; Thie and van Wijk 1998). However, the extent to which shared space adds to the social presence remains an empirical question. It seems likely that as technology increasingly supports social or para-social interactions and conveys non-verbal communicative cues social presence will increase.

2.2.2.2 Social Realism

Social realism refers to the consistency of information with the real world, that is, the degree to which the virtual world mimics the real world (Witmer and Singer 1994). When information presented to the user highly reflecting the realistic social context, it creates a more meaningful mediated experience for customers in the virtual world. The familiarity of the real world and the previous real world experiences help online customers better understand and immerse into the virtual world. Furthermore, agreeing with the key role of perceived possible interactions in presence, researchers stress that "action is essentially social" (Mantovani and Riva 1999). Experiencing presence depends on whether the virtual world behaves and is constructed according to our cultural expectations and whether the virtual world is perceived and interpreted the same by others in the virtual world (Schuemie et al. 2001).

3. Consumer Learning

From a marketing perspective, consumer learning can be thought as “the process by which individuals acquire the purchase and consumption knowledge and experience that they apply to future related behavior” (Schiffman and Kanuk 1997). Consumer learning is an important process relating to product knowledge, memory, attitude and purchase decision. Considering the effects on the market outcome of the importance of consumer learning, marketers have been seeking best ways to enhance consumer learning in order to obtain competitive advantage. Helping consumers learn has been posited to be an efficient marketing communication goal and lead to the long-term profit performance of many firms (Wernerfelt, 1996).

There are two basic approaches to learning: behavioral learning theory and cognitive learning theory. Behavioral learning theory is based on a stimulus-response orientation where the role of reinforcement is critical; while cognitive learning theory holds that learning involves complex mental processing of information, and emphasizes the roles of motivation and mental processes in producing a desired response. Cognitive processes such as perception, belief formation, attitude development and change, and integration are important to understanding consumer learning and decision-making process. However, cognitive learning theory could explain most of consumer online consumption behaviors where they encounter new purchase situation and are likely to use extensive information processing. In recent years, consumer cognitive responses are given much attention as measures of how consumers react to product information presented and what they learn from it (Wilkie 1994).

Consumers learn about products through direct experience and indirect experience (Deighton 1984; Hoch and Ha 1986; Hoch and Deighton 1989; Kempf and Smith 1998; Smith and Swinyard 1982, 1983, 1988). Direct experience is generated from actual product contact and experience, while indirect experience occurs when consumer don't experience the product personally and directly, but rather, learn about it second hand or indirectly, such as advertising. Recently, a third kind of experience - virtual experience, which is defined as “psychological and emotional states that consumers undergo while interacting with products in a 3-D environment”, is proposed to be located between direct experience and indirect experience within the spectrum of consumer learning, and possesses advantages of direct and indirect experience for consumer learning (Li et al. 2001, 2002). However, telepresence by nature is a compelling online virtual experience, which can “create for the user a strong sense of presence”; therefore it may also take advantages of both direct and indirect experience for consumer learning. By creating telepresence, marketers may substantially improve the value of product information presented and engage consumers in an active and enhanced learning experience.

4. Impact of Telepresence on Consumer Learning: Theoretical Background and Propositions

New information technology has made it possible to create brand new online experiences (e.g. telepresence) for the consumer as well as flexible ways of dealing with product information that are not possible in real world shopping. This may potentially facilitate the consumer learning process, e.g. product knowledge, memory, attitude, and purchase decision. Based on an extensive review of the literature on cognitive and social psychology theories, attention theories, and visual search theories, we decided to adopt consumer information processing approach to understand the impact of telepresence on consumer learning. We drew on the visual search theories (Yantis and Egeth 1999) to examine how telepresence attract attention, the multiple capacity theory (Navon and Gopher 1979; Allport 1980; Wickens 1980, 1992) to

understand allocation of attentional resources in the case of telepresence, and the ELM theory (Petty and Cacioppo 1986) to understand how telepresence facilitates elaboration and comprehension.

4.1 Consumer Information Processing

Consumer information processing contains the following main stages: exposure, attention, comprehension, acceptance, and retention. Exposure to a stimulus is the first step where consumers' sensory organs are activated. When a consumer is exposed to information, the intensity of the stimulus is one of the factors that determine whether or not consumer goes on to actively attend to it (Mowen and Minor 1998). Compared with banner advertising and other traditional advertising forms, telepresence provides the most intensive stimulus that engages the most of consumer sensory system.

Attention is the allocation of cognitive capacity to an object or task. Posner (1980) proposed that attention is deployed to stimuli endogenously or exogenously. Endogenous attention (top-down or goal-driven attention) is presumed to be under the strict supervision according to the observer's goals, while exogenous attention (bottom-up or stimulus-driven attention) is outside the observer's control and driven by an external stimulus event, i.e. salient parts of observer's view. The deployment of attention is determined jointly by properties of the image and the goals of the observer (Egeth and Yantis 1997; Chun and Wolfe 2001).

Comprehension is the process through which individuals organize and interpret information. Consumers may draw upon experience, memory, and expectations to attach meaning to a stimulus. We propose that telepresence may greatly facilitate consumer comprehension. The simulated direct product experience, as well as ability of parallel processing helps consumers interpret the vast amount of information they encounter online. In addition, telepresence allows control over the flow of information can increase a consumer's cognitive ability to integrate and understand the information presented (Ariely 2000; Hoffman and Novak 1997).

Acceptance refers to the extent consumers are persuaded by the information presented. Credibility and attitude change are key points in this stage. Researchers claim that telepresence may take advantage of direct product experience, and will result in consumer confidence and persuasion effect (Jeandrain 2001; Klein 2002).

Retention relates to consumer's memory, and is important to marketers because consumers often do not make purchase decisions at the time of exposure, attention, and comprehension. Telepresence enables online consumers to create the order of the information and organize the information to fit their particular style. Hence, they may learn more and remember more in that information is not processed in a linear fashion as in traditional advertisements (Shih 1998). Studies exploring telepresence effects show that telepresence has positive impact on consumer learning and memory (Lombard and Ditton 1997; Regenbrecht et al. 1998).

4.2 Visual Search Theory – Salience and Attention

Attention is proposed to be limited, and is allocated selectively to objects in the visual field (Lachman et al. 1979; Van der Heijden 1992; Vecera and Farah 1994). Marketers have long been striving to capture consumer's attention. However, the consumer's attention to the message can vary, depending upon personal characteristics (involvement, beliefs and attitudes, etc.) and message characteristics (color, intensity, contrast, movement, etc.).

Visual search theories suggest that the ability to draw attention depends on the salience of visual objects (Yantis and Egeth 1999; Nothdurft 1993). According to Taylor and Thompson (1982), salience refers to the " phenomenon that when one's attention is differentially directed to one portion of the environment rather than to others, the information contained in that portion will receive disproportionate weighting to subsequent judgments." In other words, when information is perceptually prominent, it captures attention. Salience is an effective use of limited processing resources, as low salience requires more processing due to their poor signal-to-noise ratios (Treue 2003). Compared to a static website, telepresence provides highly salient features, thus can draw consumers' attention to product information effectively.

However, attracting consumers' attention is not the ultimate goal of marketers but a means to imprint product information in the mind of consumers (Hong et al. 2004). Recall is proposed to be a good measure of attention (Davenport and Beck 2001).

4.3 Multiple Resource Capacity Theory – Parallel Processing and Comprehension

Despite the limited capacity of consumer cognitive systems, consumers are able to divide their attention among different tasks. Kahneman (1973) proposed a flexible central resource capacity model that suggests parallel processing could occur in all of the processing stages. In Kahneman's theory, there is a central processor that allocates the limited attentional resource. However, according to multiple resource capacity theory (Navon and Gopher 1979; Allport 1980; Wickens 1980, 1992), there exist several attentional resources, each with limited capacity and each specific to a component of skill. Different tasks may perform simultaneously when they require different attentional resources.

Telepresence as a compelling virtual experience occupies most of consumer sensory organs - sight, touch, smell, hearing, and taste, and enables consumers' parallel processing of various product information. This may greatly improve consumer comprehension efficiency.

4.4 ELM Theory – Elaboration and Comprehension

Comprehension processes vary in their extensiveness or elaboration (Anderson and Lynne 1979; Petty and Cacioppo 1986). The ELM theory proposes that when situational and individual variables ensure high motivation and ability, people are likely to focus on message argument and process more of information (Petty and Cacioppo 1986). The degree of elaboration during comprehension determines the amount of product knowledge. More elaborate comprehension produces a greater number of meanings that tend to be organized as more complex knowledge structures (Peter and Olson 1998).

Telepresence is proposed to take advantage of direct product experience (Reeves and Nass 1996). Jeandrain (2001) claimed that direct product experience entails that people will follow central route since greater cognitive elaboration is required during this kind of experience (Eagly and Chaiken 1993).

4.5 Comprehension, Product Knowledge, and Memory

Consumer comprehension processes may influence consumers' product knowledge structures (Peter and Olson 1998) and their ability to remember the meanings created during comprehension (d'Astous and Dubuc 1986; Olson 1980; Stayman and Batra 1991). Deep comprehension processes create more abstract meanings that are less tangible, more self-relevant, and tend to be remembered better. In contrast, shallow comprehension processes produce more concrete meanings that may result in lower levels of recall and recognition. Furthermore, more elaborate comprehension processes create greater numbers of

meanings that tend to be interconnected and organized in a more complex knowledge structures (Peter and Olson 1998). Memory will be enhanced because the activation of one meaning can spread to other connected meanings and bring them to conscious awareness (Keller 1987; Myers-Levy 1989). In conclusion, factors that facilitate consumers to engage in deeper, more elaborate comprehension processes tend to produce meanings and knowledge that consumer will remember better.

Proposition 1: Telepresence will have positive impact on product knowledge.

Proposition 2: Telepresence will have positive impact on memory.

5. Conclusion

The purpose of this study was to investigate the telepresence concept in e-commerce context, as well as its impact on consumer learning from a consumer information processing perspective. With the rapid development of information technology, telepresence is becoming the design goal of virtual reality. However, in the context of e-commerce, the appropriate focus of telepresence should be the consumer experience rather than the technology. Note that consumer learning plays an important role in consumer purchase decision. We intended to investigate the impact of telepresence on consumer learning by drawing upon theories from cognitive and social psychology literature and visual search literature. In this study, we developed a comprehensive conceptualization of the telepresence construct in e-commerce context. We further discussed the impact telepresence on consumer learning from a consumer information processing perspective. With the ever increasing ability of information technology, information environment of our society will be significantly modified. Its impact on human cognition, perception, attention, comprehension, and retention will also be profound. This research is a beneficial attempt to integrate consumer information processing theory in investigating telepresence impact on consumer leaning. However, to fully understand the information technology on consumer learning and other cognitive responses and activities, more theoretical research need to be conducted.

Reference

Aberg, J., and Shahmehri, N. “The Role of Human Web Assistants in E-Commerce: An Analysis and a Usability Study,” *Internet Research: Electronic Networking Applications and Policy* (10:2), 2000, pp. 114-125.

Allport, D. A. “Attention and Performance,” in *Cognitive Psychology: New Directions*, G. Claxton (ed.), Routledge and Kegan Paul, London, 1980, pp. 112-153.

Anderson, J. R., and Reder, L. M. “An Elaborative Processing Explanation of Depth of Processing,” in *Levels of Processing in Human Memory*, L.S. Cermak and F.I.M. Craik (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1979.

Andreou, A. S., Mavromoustakos., S. M., and Schizas, C. N. “Enhancing the Analysis Phase of E-Commerce Systems Development with Human, Social, Cultural and Organizational Factors,” in *Electronic Commerce: Theory and Applications*, B. Wiszniewski (ed.), Gdansk, 2002, pp. 5-12.

Ariely, D. “Controlling the Information Flow: Effects on Consumers’ Decision Making and Preferences,” *Journal of Consumer Research*, (27:2), 2000, pp. 233-248.

Bailenson, J. N., Blascovich, J., Beall, A. C., and Loomis, J. M. “Equilibrium Theory Revisited: Mutual Gaze and Personal Space in Virtual Environments,” *Presence: Teleoperators and Virtual Environments*, (10:6), 2001, pp. 583-598.

Barfield, W., and Hendrix, C. “The Effect of Update Rate on the Sense of Presence within Virtual Environments,” *Virtual Reality: The Journal of the Virtual Reality Society*, (1:1), 1995, pp. 3-16.

Bettman, J. R. *An Information Processing Theory of Consumer Choice*, Addison Wesley, Reading, MA, 1979.

Biocca, F., and Delaney, B. “Immersive Virtual Reality Technology,” in *Communication in the Age of Virtual Reality*, F. Biocca, and M. Levy (eds.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1995, pp. 15-32.

Biocca, F., Harms, C., and Burgoon, J. K. “Criteria for a Theory and Measure of Social Presence,” 2002. http://www.mindlab.msu.edu/Biocca/papers/2002_scope_conditions_social_presence.pdf

Bystrom, K. E., Barfield, W., and Hendrix, C. “A Conceptual Model of the Sense of Presence in Virtual Environments,” *Presence: Teleoperators and Virtual Environments*, (8:2), 1999, pp. 241-244.

Cassell, J., Sullivan, J., Prevost, S., and Churchill, E. *Embodied Conversational Agents*, Cambridge, MIT Press, 2000.

Choi, Y. *Consumer Response to Advertising Agents*, Unpublished Dissertation, Michigan State University, East Lansing, MI, 2000.

Chun, M. M., and Wolfe, J. M. “Visual Attention,” in *Blackwell's Handbook of Perception*, E. B. Goldstein (ed.), Blackwell, Oxford, UK, 2001, pp. 272-310.

d’Astous, A., and Dubuc, M. “Retrieval Processes in Consumer Evaluative Judgment Making: The Role of Elaborative Processing,” in *Advances in Consumer Research*, Vol. 13, R. J. Lutz (ed.), Association for Consumer Research, Provo, UT, 1986, pp. 132-137.

Davenport, T. H., and Beck J. C. *The Attention Economy: Understanding the New Currency of Business*, Harvard Business School Press, Boston, MT, 2001.

Deighton, J. “The Interaction of Advertising and Evidence,” *Journal of Consumer Research*, 11 (December), 1984, pp. 763-770

Draper, J. V., Kaber, D. B., and Usher, J. M. “Telepresence,” *Human Factors*, (40:3), 1998, pp. 354-375.

Eagly, A. H., and Chaiken, S. *The Psychology of Attitudes*, Harcourt Brace Jovanovich, Fort Worth, TX, 1993.

Egeth, H. E., and Yantis, S. “Visual Attention: Control, Representation, and Time Course,” *Annual Review of Psychology*, 48, 1997, pp. 269--297.

Ghose, S., and Dou, W. Y. “Interactive Functions and Their Impacts on the Appeal of Internet Presences Sits,” *Journal of Advertising Research*, (38:2), 1998, pp. 29-43.

Gibson, J.J. *The Senses Considered As Perceptual Systems*, Houghton Mifflin, Boston, MA, 1966.

Grigorovici, D. “Persuasive Effects of Presence in Immersive Virtual Environments”, in *Being There: Concept, Effects and Measurement of User Presence in Synthetic Environments*, G. Riva, F. Davide, and W. A. IJsselsteijn (eds.), Ios Press, Amsterdam, Netherlands, 2003, pp. 192-205.

Hanss, T. “Application-driven Technology,” *Proceedings of the Internet 2 Socio-Technical Summit*, Ann Arbor, MI, 1999, pp. 103-111.

Heeter, C. “Being There: The Subjective Experience of Presence,” *Presence: Teleoperators and Virtual Environments*, (1:1), 1992, pp. 120-126.

Heeter, C. “Interactivity in the Context of Designed Experiences,” *Journal of Interactivity Advertising*, (1:1), 2000.

Held, R. M., and Durlach, N. I. “Telepresence,” *Presence: Teleoperators and Virtual Environments*, (1:2), 1992, pp. 262-271.

Hendrix, C., and Barfield, W. "Presence within Virtual Environments as a Function of Visual Display Parameters," *Presence: Teleoperators and Virtual Environments*, (5:3), 1996, pp. 274-289.

Hoch, S. J., and Deighton, J. "Managing What Consumers Learn from Experience," *Journal of Marketing*, 53 (April), 1989, pp. 1-20.

Hoch, S. J., and Ha, Y. W. "Consumer Learning: Advertising and the Ambiguity of Product Experience," *Journal of Consumer Research*, 13 (September), 1986, pp. 221-233.

Hoffman, D. L., and Novak, T. P. "Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations," *Journal of Marketing*, (60:3), 1996, pp. 50-69.

Hoffman, D. L., and Novak, T. P. "A New Marketing Paradigm for Electronic Commerce," *Information Society*, (13:1), 1997, pp. 43-54.

Hong, W., Thong, J.Y.L., and Tam, K.Y. "Does Animation Attract Online Users' Attention? The Effects of Flash on Information Search Performance and Perceptions," *Information Systems Research*, (Forthcoming).

Horton, D., and Wohl, R. R. "Mass Communication and Para-Social Interaction: Observations on Intimacy at a Distance," *Psychiatry*, (19:3), 1956, pp. 215-229.

Ijsselsteijn, W. A., de Ridder, H., Freeman, J., and Avons, S. E. "Presence: Concept, Determinants and Measurement," *Proceedings of SPIE: Human Vision and Electronic Imaging*, B. E. Rogowitz and T. N. Pappas (eds.), San Jose, CA, 3959, 2000, pp. 520-529.

IJsselsteijn, W. A., de Ridder, H., Freeman, J., Avons, S. E., and Bouwhuis, D. "Effects of Stereoscopic Presentation, Image Motion and Screen Size on Subjective and Objective Corroborative Measures of Presence," *Presence: Teleoperators and Virtual Environments*, (10:3), 2001, pp. 298-311.

Jeandrain, A. C. "Essay about Telepresence Effects on Persuasion: Three Possible Explanations," Paper presented at *Presence 2001 - The Fourth Annual International Workshop on Presence*, Philadelphia, PA, 2001. http://astro.temple.edu/~lombard/P2001/Jeandrain1.pdf

Kahneman, D. *Attention and Effort*, Englewood Cliffs, Prentice-Hall, NJ, 1973.

Keller, K. L. "Memory Factors in Advertising: The Effect of Advertising Retrieval Cues on Brand Evaluations," *Journal of Consumer Research*, 14, 1987, pp. 316-333.

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

Kim, T., and Biocca, F. "Telepresence via Television: Two Dimensions of Telepresence May Have Different Connections to Memory and Persuasion," *Journal of Computer-Mediated Communications*, (3:2), 1997. http://www.ascusc.org/jcmc/vol3/issue2/kim.html

Klein, L. R. "Creating Virtual Experiences in Computer-Mediated Environments," *Review of Marketing Science Working Papers*, (1:4), 2002, Working Paper 2. http://www.bepress.com/roms/vol1/iss4/paper2

Kristof, R., and Satran, A. *Interactivity by Design: Creating and Communication with New Media*, Adobe Press, CA, 1995.

Kumar, N., and Benbasat. I. "Para-Social Presence and Communication Capabilities of a Web Site," *e-Service Journal*, (1:3), 2002, pp. 5-24.

Lachman, R., Lachman, J. L. and Butterfield, E. C. *Cognitive Psychology and Information Processing*, Lawrence Erlbaum Associates, Hillsdale, NJ, 1979.

Lessiter, J., Freeman, J., Keogh, E., and Davidoff, J. "A Cross-media Presence Questionnaire: The ITC–Sense of Presence Inventory," *Presence: Teleoperators and Virtual Environments*, (10:3), 2001, pp. 282-297.

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

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

Li, H., Daugherty, T., and Biocca, F. "The Role of Virtual Experience in Consumer Learning," *Journal of Consumer Psychology (forthcoming)*, 2002. http://elab.vanderbilt.edu/elib/upload/172/JCP.pdf

Lombard, M., and Ditton, T. "At the Heart of It All: The Concept of Telepresence," *Journal of Computer-Mediated Communication*, (3:2), 1997. http://www.ascusc.org/jcmc/vol3/issue2/lombard.html

Lombard, M., and Snyder-Duch, J. "Interactive Advertising and Presence: A Framework," *Journal of Interactive Advertising*, (1:2), 2001. http://www.jiad/vol1/no2/lombard/index.html

Lund, N. *Attention and Pattern Recognition*, Routledge, 2001.

Mantovani, G., and Riva, G. "Real Presence: How Different Ontologies Generate Different Criteria for Presence, Telepresence, and Virtual Presence," *Presence: Teleoperators and Virtual Environments*, (8:5), 1999, pp. 540-550.

Milgram, P., and Ballantyne, J. "Real World Teleoperation via Virtual Environment Modelling," *Proceedings of the International Conference on Artificial Reality & Tele-existence ICAT'97*, Tokyo, Japan, 1997, pp. 1-9.

Minsky, M. *Telepresence*, Omni, 1980, pp. 45-51.

Mowen, J.C., and Minor, M. *Consumer Behavior*, 5th ed., Prentice Hall, New Jersey, 1998.

Mühlbach, L., Böcker, M., and Prussog, A. "Telepresence in Videocommunications: A Study on Stereoscopy and Individual Eye Contact," *Human Factors*, (37:2), 1995, pp. 290-305.

Myers-Levy, J. "Priming Effects on Product Judgments: A Hemispheric Interpretation," Journal of Consumer Research, 16, 1989, pp. 76-86.

Navon D., and Gopher, D. "On the Economy of the Human Processing System," *Psychological Review*, 86, 1979, pp. 214-255.

Newhagen, J. E., and Rafaeli, S. "Why Communication Researchers Should Study the Internet: A Dialogue," *Journal of Communication*, (46:1), 1996, pp. 4-13.

Nothdurft, H.C. "Saliency Effects Across Dimensions in Visual Search," *Vision Research*, 33, 1993, pp. 839-844.

Novak, T. P., and Hoffman, D. L. "Measuring the Flow Experience Among Web Users," *Project 2000 Working Paper*, 1997. http://elab.vanderbilt.edu/research/papers/pdf/manuscripts/Flow-MeasuringFlowExpJul1997-pdf.pdf

O'Brien, E.J., Rizzella, M.L., Albrecht, J.E., and Halleran, J.A. "Updating Situational Models," *Journal of Experimental Psychology: Learning, Memory and Cognition*, 24, 1998, pp. 1200-1210.

Olson, J. C. "Encoding Processes: Levels of processing and Existing Knowledge Structures," in *Advances in Consumer Research*, Vol.7, J. C. Olson (ed.), Association for Consumer Research, Ann Arbor, Mich, 1980.

Peter, J.P., and Olson, J.C. *Consumer Behavior and Marketing Strategy*, 5th ed., Irwin, Chicago, 1998.

Petty, R.E., and Cacioppo, J.T. *The Elaboration Likelihood Model of Persuasion*, Academic Press, New York, 1986.

Posner, M. I. "Orienting of Attention," *Quarterly Journal of Experimental Psychology*, 32, 1980, pp. 3-25.

Rafaeli, S. "Interactivity: From New Media to Communication," in *Advancing Communication Science: Merging Mass and Interpersonal Processes*, R. P. Hawkins, J. M. Wiemann, and S. Pingree (eds.), Sage Publications, Beverly Hills, CA, 1989, pp. 110-134.

Reeves, B., and Nass, C. *The Media Equation: How People Treat Computers, Television, and New Media Like Real People and Places*, Cambridge University Press, New York, 1996.

Regenbrecht, H. T., Schubert, T. W., and Friedmann, F. "Measuring the Sense of Presence and its Relations to Fear of Heights in Virtual Environments," *International Journal of Human-Computer Interaction*, (10:3), 1998, pp. 233-249.

Rice, R. E. "Task Analyzability, Use of New Medium and Effectiveness: A Multi-site Exploration of Media Richness," *Organization of Science*, (3:4), 1992, pp. 475-500.

Schiffman, L., and Kanuk, L, *Consumer Behavior*, 6th ed., Prentice Hall, New Jersey, 1997.

Schloerb, D.W. "A Quantitative Measure of Telepresence," *Presence: Teleoperators and Virtual Environments*, (4:1), 1995, pp. 64-80.

Schubert, T., Friedmann, F., and Regenbrecht, H. "The Experience of Presence: Factor Analytic Insights," *Presence: Teleoperators and Virtual Environments*, (10:3), 2001, pp. 226-281.

Schuemie, M.J., van der Straaten, P., Krijn, M., and van der Mast, C. "Research on Presence in Virtual Reality: A Survey", *CyberPsychology & Behavior*, (4:2), 2001, pp. 183-201.

Sheridan, T. B. "Musings on Telepresence and Virtual Presence," *Presence: Teleoperators and Virtual Environments*, (1:1), 1992, pp. 120-126.

Sheridan, T. B. "Further Musings on the Psychophysics of Presence," *Presence: Teleoperators and Virtual Environments*, (5:2), 1996, pp. 241-246.

Shih, E. C. "Conceptualizing Consumer Experiences in Cyberspace," *European Journal of Marketing*, (32:7-8), 1998, pp. 665-663.

Short, J., Williams, E., and Christie, B. The *Social Psychology of Telecommunicaitons*, John Wiley & Sons, New York, 1976.

Slater, M., and Usoh, M. "Representation Systems, Perceptual Position, and Presence in Immersive Virtual Environments," *Presence: Teleoperators and Virtual Environments*, (2:3), 1993, pp. 221-233.

Slater, M., Usoh, M., & Steed, A. "Depth of Presence in Virtual Environments," *Presence: Teleoperators and Virtual Environments*, (3:2), 1994, pp. 130-144.

Slater, M., and Wilbur, S. "A Framework for Immersive Virtual Environments (FIVE): Speculations on the Role of Presence in Virtual Environments," *Presence: Teleoperators and Virtual Environments*, (6:6), 1997, pp. 603-616.

Slater, M., Sagadic, A., Usoh, M., and Schroeder, R. "Small Group Behavior in a Virtual and Real Environment: A Comparative Study," *Presence: Teleoperators and Virtual Environments*, (9:1), 2000, pp. 37-51.

Smith, R. E., and Swinyard, W. R. "Information Response Models: An Integrated Approach," *Journal of Marketing*, (46:1), 1982, pp. 81-93.

Smith, R. E., and Swinyard, W. R. "Attitude-Behavior Consistency: The Impact of Product Trial Versus Advertising," *Journal of Consumer Research*, (20:3), 1983, pp. 257-267.

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

Stayman, D. M., and Batra, R. "Encoding and Retrieval of Ad Affect in Memory," *Journal of Marketing Research*, 28, 1991, pp. 232-239.

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

Taylor, S. E., and Thompson, S. C. "Stalking the Elusive 'Vividness' Effect," *Psychological Review*, 89, 1982, pp.155-181.

Teo, H. H., Oh, L. B., Liu, C. H., and Wei, K. K. "An Empirical Study of the Effects of Interactivity on Web User Attitude," *International Journal of Human-Computer Studies*, (58:3), 2003, pp. 281-305.

Thie, S., and van Wijk, J. "A General Theory on Presence: Experimental Evaluation of Social Virtual Presence in a Decision Making Task", Paper presented at the *Presence in Shared Virtual Environments Workshop*, University College London, 1998.

Treue, S. "Visual Attention: the Where, What, How and Why of Saliency," *Current Opinion in Neurobiology*, 13, 2003, pp. 428-432.

Van der Heijden, A.H.C. *Selective Attention in Vision*, Routledge, London-New York, 1992.

Vecera, S. P., and Farah, M. J. "Does Visual Attention Select Objects or Locations?" *Journal of Experimental Psychology: Gener*al, 123, 1994, pp. 146-160.

Weitz, B. A. "Relationship between Salesperson Performance and Understanding of Customer Decision Making," *Journal of Marketing Research*, (15:4), 1978, pp. 501-516.

Wernerfelt, B. "Efficient Marketing Communication: Helping the Customer Learn," *Journal of Marketing Research*, 33(May), 1996, pp. 239-246.

Wickens, C. D. "The Structure of Processing Resources," in *Attention and Performance VII*, R. Nickerson (ed.), Lawrence Erlbaum Associates, Hillsdale, NJ, 1980, pp. 239-257.

Wickens, C. D. *Engineering Psychology and Human Performance*, 2nd ed., Harper Collins, New York, 1992.

Wilkie, W. *Consumer Behavior*, 3rd ed., John Wiley and Sons, 1994.

Williams, F., Rice, R. E., and Rogers, E.M. *Research Methods and the New Media*, The Free Press, New York, 1989.

Witmer, B. G., and Singer, M. J. *Measuring Immersion in Virtual Environments*, (Tech. Report 1014), Alexandria, VA, U.S. Army Research Institute for the Behavioral and Social Sciences, 1994.

Wright, P. L. "The Cognitive Process Mediating Acceptance of Advertising," *Journal of Marketing Research*, (9:1), 1973, pp. 53-62.

Yantis, S., and Egeth, H. "On the Distinction between Visual Salience and Stimulus-driven Attentional Capture," *Journal of Experimental Psychology: Human Perception and Performance*, (25:3), 1999, pp. 661-676.

Zeltzer, D. "Autonomy, Interaction, and Presence," *Presence: Teleoperators and Virtual Environments*, (1:1), 1992, pp. 127-132.